MATERNAL AND PERINATAL OUTCOMES IN IVF PREGNANCIES COMPARED TO SPONTANEOUSLY CONCEIVED PREGNANCIES

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I hereby declare that the thesis entitled **"MATERNAL AND PERINATAL OUTCOMES IN IVF PREGNANCIES COMPARED TO SPONTANEOUSLY CONCEIVED PREGNANCIES"** submitted towards partial fulfillment of the requirements for the award of **MD in Obstetrics & Gynaecology** degree to BFUHS is a compilation of original work carried out by me under the supervision of **Dr. Pooja Tandon**, Professor, Department of Obstetrics & Gynaecology and **Dr. Ashima Taneja**, Professor & Head, Department of Obstetrics & Gynaecology. No part of this thesis has formed the basis for the award of any degree previously.

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Dedicated

to

my Family,

friends

&

Teachers

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DR ROMI

ABBREVIATIONS

APH	Ante Partum Hemorrhage
ART	Assisted Reproductive Techniques
BMI	Body Mass Index
DM	Diabetes Mellitus
DNA	Deoxyribose Nucleic Acid
FGR	Fetal Growth Restriction
GDM	Gestational Diabetes Mellitus
GnRH	Gonadotropin Releasing Hormone
HTN	Hypertension
ICP	Intrahepatic Cholestasis of Pregnancy
IUFD	Intra Uterine Fetal Death
IUI	Intra Uterine Insemination
IVF	In Vitro Fertilization
IVF ET	In Vitro Fertilization Embryo Transfer
LBW	Low Birth Weight
LBW	Low Birth Weight
LSCS	Lower Segment Cesarian Section
NICU	Neonatal Intensive Care Unit
P.E	Pre Eclampsia
PPH	Post Partum Hemorrhage
PPROM	Preterm Premature Rupture Of Membranes
PTD	Pre Term Delivery
PTLP	Pre Term Labour Pain
VEGF	Vascular endothelial growth factor
WHO	World Health Organisation

ABSTRACT

Introduction: The aim of IVF is to maximize success along with safety both short term and long term to the woman and offspring. With increasing incidence of IVF and more children being born as a result, there is more interest in maternal and perinatal outcomes of IVF pregnancies.

Aim of Study: It was to analyse age and parity matched maternal and perinatal outcomes in IVF and spontaneously conceived pregnancies.

Materials & Methods: There were selected 100 women who had delivery at DMCH between September 2022- September 2023. The study group consisted of 50 IVF conceived patients. Control group had 50 women who conceived spontaneously.Matching was done with respect to age and parity.

Results: The rate of pre eclampsia, gestational diabetes mellitus and multiple pregnancies was significantly higher in IVF group. (p value <0.05). The risk of intrapartum and postpartum complications in IVF and spontaneous group was not statistically significant.IVF group had demonstrated more number of deliveries with period of gestation <37 weeks than spontaneous group and it was statistically significant. (p value <0.05). The mode of delivery was the lower segment cesarian section in a majority of IVF conceived patients (78%). The most common indication of cesarian section was maternal request (28.2%). Mean NICU stay was 13.76 days vs 9.05 days in IVF vs spontaneously conceived patients (p value <0.05). Mean birth weight was 1.88kg vs 2.50 kg in IVF vs spontaneously conceived patients. (p value <0.05).

Conclusions: There are increasing IVF conceptions due to rising incidence of infertility. According to literature, ART increases the chances of pregnancy related maternal and perinatal complications comprising pre-eclampsia, GDM, increased rate of cesarean delivery, preterm births, low birth weight and higher NICU admissions. Thus, all patients undergoing ART procedures should receive pre-conceptional counseling regarding the associated maternal and perinatal risks and consider ART conceived pregnancy as a high-risk pregnancy. The medical team is advised to maintain a close vigilance during the antepartum, intrapartum and postpartum period to balance the risk of complications.

Keywords: In vitro fertilization, spontaneous, maternal, perinatal, outcomes

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INTRODUCTION

Infertility is defined as inability to conceive after 12 months of regular unprotected sexual intercourse in women less than 35 years or six months in women 35 years or older.[1] According to the WHO, infertility is the seventh most significant disability worldwide among the young population.[2] The incidence is on the rise and impacts about 10% to 15% of couples globally.[3] The incidence of infertility is around 3.9 to 16.8% in India.[4]

The use of ART is on the rise among patients with male or female causes of infertility. Reproductive medicine has made such significant advancement that many couples for whom adoption was the sole choice in the past can now become biological parents. In vitro fertilization (IVF) has become a boon for infertile patients but it may be associated with some complications. Over time, several aspects of IVF treatment have evolved. While the rate of pregnancies achieved through IVF has increased dramatically in recent years, this group has been found to have more frequency of complications. The number of multiple pregnancies and numerous other complications are on the rise due to the widespread utility of IVF services. However, whether these complications occur due to assisted reproduction techniques or infertility problems remains to be explained. The influencing elements of IVF have been the subject of numerous studies aimed at improving the outcomes of IVF; however still there is lack of knowledge about the parameters that predict IVF outcomes.[5]

Age is the most important factor contributing to female infertility; specifically, ovarian reserve declines with age. Infertility in women can also be caused by tubal factors, ovulatory abnormalities, endometriosis, cervical factors and unexplained infertility. [6] Sperm production issues, genetic factors, ejaculation dysfunctions and lifestyle factors such as smoking, alcohol and drug abuse are common reasons of male infertility. [7]

The evaluation of infertile couples includes an assessment of ovulatory function, ovarian reserve, tubal patency, uterine cavity and a semen analysis. [8]

IVF services benefit the infertility patients having obstructed or damaged fallopian tubes, endometriosis, high titres of anti-sperm antibodies, hostile cervical mucus, male factors (low sperm count, low normal morphology ,low motility and unexplained infertility.

The process revolves around the evaluation of infertilty and role of interprofessional team in management strategies for IVF.[9]

Initially intended to assist infertile couples, IVF is now being used for medical and genetic conditions and fertility preservation as well. Although infertility, which affects about 10% of the couples, remains to be the main driver of utilization of IVF services. [10]

A “good perinatal outcome” after ART is the birth of a living neonate at term gestation (≥37 weeks period of gestation) with a neonatal birth weight ≥2,500 g. However, there are concerns about the complications of ART and its impact on maternal and perinatal health. [11] Invitro fertilization pregnancies are associated with an increased risk of complications such as pre eclampsia, preterm labour pain, preterm delivery and many other perinatal complications. [12]

The ART cycle is not flawless and is linked to several maternal and perinatal complications. This raises concern regarding the overall safety of these ART techniques. There is higher incidence of preeclampsia in IVF pregnancies compared to spontaneous pregnancies.

The Geographic and diagnostic ranges affect the prevalence of gestational diabetes (GDM). The global prevalence of GDM has been reported as 7 to 25%. Many factors including multiple pregnancies, obesity and in vitro fertilization influence the risk of developing GDM during pregnancy. [12] Studies have shown that patients who underwent IVF were more likely to develop other complications as well, such as

ICP, placental complications such as previa, placental abruption, placental adherence, preterm premature rupture of membranes, postpartum hemorrhage, polyhydramnios than spontaneously conceived pregnancies. [13]

Whether the pregnancy is a singleton or multiple gestation, remains to be an important factor for outcomes.[14] Researchers have concluded that the rise in multiple pregnancies among IVF patients maybe a contributing factor to the higher incidence of complications in this population. At the same time, some studies have shown that complications also occur in singleton pregnancies obtained through invitro fertilisation. [15]

Many studies have also reported increased neonatal morbidity due to preterm births and low birth weight in IVF conceived pregnancies. These neonates have a higher risk of NICU admissions. They have more chances to be hospitalized in NICU for feed intolerance, sepsis, respiratory complications such as respiratory distress syndrome (RDS), metabolic complications (hypoglycaemia, hyperbilirubinemia) and necrotizing enterocolitis. [16]

The causes for maternal and perinatal complications associated with invitrofertilisation are multifactorial. Firstly, age group of the infertile couple and the factors causing infertility. Higher maternal age is considered an important factor. Advanced age may put women with IVF conceived pregnancies at more risk of pregnancy complications. Conversely, the higher incidence of maternal and perinatal complications associated with advanced age is probably exacerbated by ART. [17]

Secondly, there are many factors related to ART methods like technique used for fusion of gametes (invitrofertilisation or intracytoplasmic sperm injection), cryopreservation methods, culture media or embryo selection methods. The gametes and embryos are

exposed to higher levels of estradiol in ART techniques. VEGF levels also increases after ovulation induction and it has a negative impact on placentation. Furthermore, gametes are also manipulated during ovum pickup and embryonic growth which is the most vulnerable period. These changes in the gamete and embryo environment may contribute to perinatal complications. The detailed mechanism is under studies. Epigenetic modification of genes which are responsible for an individual's development and differentiation may play a role. [18]
It is not possible to state with firm conviction whether the complications are determined by the techniques used in assisted reproductive techniques or the individual factors such as the etiology of infertility or maternal characteristics. [15]

As the number of infertility patients are increasing, more number of couples are adopting IVF services. Undoubtedly invitrofertilisation has given happiness to many parents and their families, but it comes with a price, the price of higher incidence of maternal and perinatal complications. There is a need to counsel couples about not just the technique and achievement rate of invitrofertilisation, but also the risk of pregnancy complications. Thus, all patients undergoing assisted reproductive technique procedure should receive pre-conceptional counseling regarding the associated maternal and perinatal risks and consider ART pregnancy as a high-risk pregnancy. (19) The currently available data regarding the invitrofertilisation pregnancies and associated maternal and perinatal complications is inconclusive and it requires further exploration. We plan to comprehensively study the impact of high technology infertility treatments on maternal and perinatal outcomes after age and parity matching. This will provide appropriate guidance for clinical practice.

AIMS AND OBJECTIVES

Primary objective:

- To analyse the maternal outcomes in mothers who opted for IVF.

Secondary objective:

- To analyse the perinatal outcome in IVF conceived children.

REVIEW OF LITERATURE

History of in vitro fertilization (IVF):

The first pregnancy achieved through in vitro human fertilisation of a human oocyte was reported by the team of John Leeton, Carl Wood and Alan Trounson from the Monash University in 1973 in The Lancet , although it lasted for only a few days and would now be called as a biochemical pregnancy. [27,28,29]

In 1977, Steptoe and Edwards successfully reported a pioneering conception which was the birth of the world's first IVF conceived baby, Louise Brown, on 25 July 1978 in Oldham General Hospital in Greater Manchester, UK [30,31]

On October 3, 1978, Dr. Subhas Mukherjee, an Indian scientist from Kolkata announced the birth of IVF conceived baby, Kanupriya alias Durga, who was world's second and India's first test tube baby. Unfortunately, his work could not be published because of lack of scientific evidence. Later Subhash Mukherjee submitted the detailed work report to the Government of West Bengal, India. [32,33,34,35]

On August 6, 1986, India's first fully scientifically documented test tube baby, 'Harsha', was born. Robert Edwards was awarded the nobel prize for the development of *in vitro* fertilization in 2010. [36,37]

Carl Wood has been called the "father of IVF (in vitro fertilization)" because he pioneered the use of frozen embryos. [38,39]

As medicine advanced, IVF was transformed from natural research to a stimulated clinical treatment. Stephanie A Beall studied challenges surrounding ovarian stimulation protocoal in the process of infertility treatment. [40,41]

There have been many refinements in the IVF process and today millions of births have occurred with the help of invitrofertilisation all over the world.(42,43,44)

There are studies that have quoted that IVF group pregnancies have higher incidence of complications such as preeclampsia, PTLPs, low birth weight neonates and more NICU admissions. These complications can be due to higher number of multifetal pregnancies with assisted reproductive techniques; however, with the policies suggesting transfer of single embryo, incidence of multiple pregnancies has been significantly reduced. Still, there is conflicting data about the outcomes of IVF pregnancies in comparison to spontaneous conception pregnancies.

A “good perinatal outcome” after ART is the birth of a living neonate at term gestation (≥37 weeks period of gestation) with a neonatal birth weight ≥2,500 g However, there are concerns about the complications of ART and its impact on maternal and perinatal health. Complications in pregnancies achieved through assisted reproductive techniques could be either related to the technology or the underlying parental factors or both. [45]

Multiple factors contribute to the maternal and perinatal complications associated with invitrofertilisation. Firstly, age group of the infertile couple and the factors causing infertility. Many women who undergo IVF are older and they are more likely to have pregnancy complications. Secondly, gametes are also manipulated during ovum pickup and embryonic growth which is the most vulnerable period. These changes in the gamete and embryo environment may contribute to perinatal complications

A retrospective analysis on the prevalence of maternal and perinatal complications compared between assisted reproductive techniques and control group of spontaneous pregnancies including a total of 112,403 women from 39 health care centres by X Yang et al in 2014 found that the incidence of pre eclampsia, diabetes mellitus in pregnancy, preterm births and placenta previa were higher in women of assisted reproductive techniques group. 85.3% of the ART pregnancy group had cesarian section, which was significantly higher than

spontaneous pregnancies (54.0%). There were more number of preterm deliveries and LBW neonates in ART group women compared with spontaneously conceived group. Neonates conceived by ART had higher incidence of low Apgar score at 5 minutes and mortality. [3]

A meta-analysis including thirty-nine cohort studies and 146,008 multiple births by J Qin et al in 2015 on comparison of maternal and perinatal outcomes of multiple gestation pregnancies with assisted reproductive technology (ART) compared to spontaneously conceived group, observed that multiple gestation pregnancies from ART were associated with more incidence of pre eclampsia, gestational diabetes mellitus ,premature rupture of membranes, preterm birth and low birth weight neonates. [46]

Linling Zhu et al., 2016 organised a retrospective cohort study of pregnancies conceived by ART (N = 2641) compared to spontaneous pregnancies group (N = 5282).Maternal and perinatal outcomes of the patients were analysed. They found that *in vitro* fertilization (IVF) conceived pregnancies had a significantly higher risk of gestational hypertension, preeclampsia, gestational diabetes mellitus, intrahepatic cholestasis of pregnancy, polyhydramnios, placenta previa, placental abruption, preterm labour, preterm premature rupture of membranes, postpartum haemorrhage, fetal growth restriction and low birth weight of neonates than spontaneous group women. [13]

J Qin et al in a meta-analysis in 2016 included fifty cohort studies comprising of 161,370 ART and 2,280,241 spontaneous conception singleton pregnant women to study whether there is any increase in obstetric and perinatal complications in singleton pregnancies after ART compared with those conceived spontaneously. He quoted that the singleton pregnancies with assisted reproductive techniques had significantly increased risk of pre eclampsia, gestational diabetes mellitus, polyhydramnios,oligohydramnios, placenta previa , placental abruption, antepartum hemorrhage, cesarean sections, postpartum

hemorrhage, preterm birth, low birth weight, small for gestational age , congenital malformation and perinatal mortality.[47]

A systematic review, followed by a meta-analysis by Sharma *et al.* with twenty studies and 5865 participants in 2016 to determine whether cigarette smoking affects human semen parameters showed that heavy smoking resulted in reduced number of sperms and alcohol consumption was associated with an increase in abnormal morphology sperms. [48]

A cross-sectional study by K Banerjee et al, on 594 infertile couples in 2016 observed that 44.1% males and 19.9% females agreed for donor eggs and 15.2% males and 19.5% females agreed for donor sperms. He concluded that the overall acceptance by the couples for donor eggs, sperms or embryos in Indian infertile couples was still low. Couples treated with their own gametes found it easier to agree to IVF and the waiting time before treatment was also much shorter. Most of the cases where the couples had been advised treatment with donor sperm or egg expressed resistance against the treatment. [49]

A prospective cohort study by J Balayla et al, 2017 on neurodevelopment outcomes after Assisted Reproductive Technologies including 2,366 pregnant women, out of which there were 278 ART conceived women , concluded that children born after ART showed no difference in cognitive scores , language scores or composite motor scores.[50]

A retrospective study including 16,616 cases by A Khudhari et al in 2021 on perinatal outcomes of singleton babies conceived spontaneously or using different ART protocols quoted that the gestational age of babies conceived spontaneously was statistically higher compared to each one of the ART conceived groups alone.[51]

H Ganer et al.,2021 in their case-control study between November 2008 and January 2020 , including 544 women with consecutive live

singleton deliveries (>24 weeks of gestation) in which each IVF pregnancy was matched to spontaneously conceived pregnancy of the same woman. They compared obstetric and perinatal outcomes between in vitro fertilization (IVF) conceived pregnancies and spontaneously conceived pregnancies and concluded that pregnancies did not differ with regard to obstetric and perinatal outcomes. Preeclampsia, instrumental delivery, number of cesarian sections, gestational age at delivery and the rates of preterm birth and small for gestational age neonates were comparable between IVF and spontaneously conceived pregnancies. Neonatal birth weight was slightly lower in IVF conceived pregnancies. [52]

A retrospective cohort study by N. Singh et al,2022 included 1125 IVF conceived singletons and 7193 spontaneously conceived singletons. They compared maternal outcomes in spontaneously singleton pregnancies to *in vitro* fertilization conception. They concluded that maternal outcomes like gestational hypertension, pre-eclampsia, oligohydramnios, gestational diabetes mellitus (GDM), chorioamnionitis, cesarian sections and instrumental deliveries were significantly different in the two groups. The IVF conceived group had a significantly higher incidence of pre eclampsia and gestational diabeties mellitus in comparison to the spontaneously conceived group. IVF significantly raised the risk of abruption by two times and independently increased the number of caesarean section by 3.1times. Overall IVF proved to be the protective factor for oligohydramnios in this study.

An ambispective observational cohort study by A Bănică et al, 2022 included 132 IVF conceived pregnancies and 157 spontaneously conceived pregnancies. They compared obstetric and perinatal outcomes following *IVF* protocoals and concluded that the IVF conceived pregnancies had more risk of pre eclampsia and placental abnormalities. Moreover, IVF conceived neonates had a higher risk of

preterm births, low neonatal birth weight (LBW), small for gestational age and more number of NICU admissions.

A multicenter case-control study was done by G Karavani et al, 2022 including 80 IVF conceived women aged 19-25 years and the other group of 160 women, matched by age and parity. They compared maternal and neonatal outcomes of young women who conceived using IVF protocoals with spontaneously conceived women and found that the IVF conceived group had a significantly higher incidence of induction of labor, meconium-stained liquor, prolonged second stage of labor and instrumental vaginal delivery .Neonatal outcomes were comparable between two groups. There was a higher number of neonates with an umbilical artery pH less than 7.1 in the IVF conceived women .Spontaneous onset of labor (vs induction of labor) was positively associated with spontaneous conception. Prolonged second stage of labor was negatively associated with spontaneous conception.[53]

A retrospective cohort study by R Yadav et al, 2023 including 140 IVF conceived pregnant women and 140 women having spontaneous conception who delivered in the study period and studied about the maternal outcomes in IVF conceived women versus spontaneously conceived women. They concluded that the risk of multiple gestation pregnancies, gestational diabetes mellitus, gestational hypertension, ICP, antepartum haemorrhage and preterm deliveries was much higher in the IVF conception group in comparison to the spontaneously conceived group and it was statistically significant. [54]

M Lang et al, 2023 in their retrospective study on 3325 advanced age women compared maternal and perinatal outcomes between in vitro fertilization conceived pregnancies and spontaneous conception. They concluded that the ART group had higher number of primigravidae women, multiple gestation pregnancies and cesarean sections. The risk of gestational hypertension, preeclampsia and number of preterm

births was significantly higher in the ART group than in the spontaneous conception women. IVF conceived women had low mean neonatal birth weight. Only gestational hypertension, however, continued to exhibit a difference which was statistically significant in the comparison of singleton pregnancies also.[55]

IVF techniques have proven to be "a boon to the medical field" for infertile couples. The goal of any ART treatment must be to secure the health of the mother and the child. However, risk of obstetric and perinatal complications with invitro fertilization techniques has been under studies. We plan to comprehensively study the effects of high technology infertility treatments. In this study we will analyse the age and parity matched maternal and perinatal outcomes in IVF and spontaneously conceived pregnant women.

MATERIALS AND METHODS

The study consisted of 100 women who had delivered at DMCH between September 2022- September 2023. Study group comprised of 50 IVF conceived patients and control group had 50 spontaneously conceived women. Matching with respect to age (±2 years) and parity was done between both the groups.

SOURCE OF DATA

The data was collected from IVF and spontaneously conceived women who delivered at Dayanand Medical College and Hospital Ludhiana, a tertiary care hospital from 15 September 2022 to 14 September 2023. IVF and spontaneously conceived women were enrolled at 20 weeks of pregnancy and were followed.

METHOD OF COLLECTION OF DATA

Inclusion Criterion

1. 20-45 years old pregnant consented females who delivered at DMCH between Sept 2022 to Sept 2023.
2. Gestational age 20 weeks and above.

Duration of Study/ Number of cases

1. September 2022- September 2023
2. Number of cases were 50
3. Number of controls were 50

OUTCOME

All patients fulfilling inclusion criteria were recruited for study. Written and informed consent was taken from all patients participating in study. A structured predesigned proforma was used for the study. A detailed

history, physical examination, clinical assessment and relevant investigations were done.

The primary objective was to study the age and parity matched maternal outcomes in IVF pregnancies compared with the spontaneously conceived pregnancies.

1. Gestational age at delivery
2. Mode of delivery
3. Maternal complications like hypertension, diabetes mellitus, PPROM. The secondary objective was to analyse the perinatal outcomes in IVF pregnancies compared with the spontaneously conceived pregnancies.

1. Birth weight
2. Sex ratio
3. NICU admission
4. Perinatal Mortality and Morbidity

Statistical Analysis

Comparison of maternal and perinatal outcomes in IVF pregnancies to spontaneous conception group was studies using appropriate statistical methods. Data was described in terms of range; mean ±standard deviation (± SD), frequencies (number of cases) and relative frequencies (percentages) as appropriate. Comparison of quantitative variables between both the groups was done using Student t-test and Mann Whitney U test for independent samples for parametric and non-parametric data respectively. For comparing categorical data, Chi square ($\chi 2$) test was performed and exact test was used when the expected frequency is less than 5. A probability value (p value) less than 0.05 was considered statistically significant. All statistical calculations was done using (Statistical Package for the Social Science) SPSS 21version (SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows.

OBSERVATION AND RESULTS

A total of 100 pregnant consented women who delivered at DMCH between September 2022- September 2023, were part of this study. Study group comprised of 50 IVF conceived patients. Control group consisted of 50 spontaneously conceived women. The demographic data, clinical data and obstetric and perinatal outcomes of all the patients enrolled in the study were documented and analysed.

The results are as follows:

Table1: Distribution of study population according to age

AGE GROUP (YEARS)	IVF		SPONTANEOUS		Total	Chi-square value	p-value
	No. of cases	%age	No. of cases	%age			
< 30	9	18.0%	10	20.0%	19	1.581	0.454
31-35	19	38.0%	24	48.0%	43		
> 35	22	44.0%	16	32.0%	38		
	50	100%	50	100%	100		

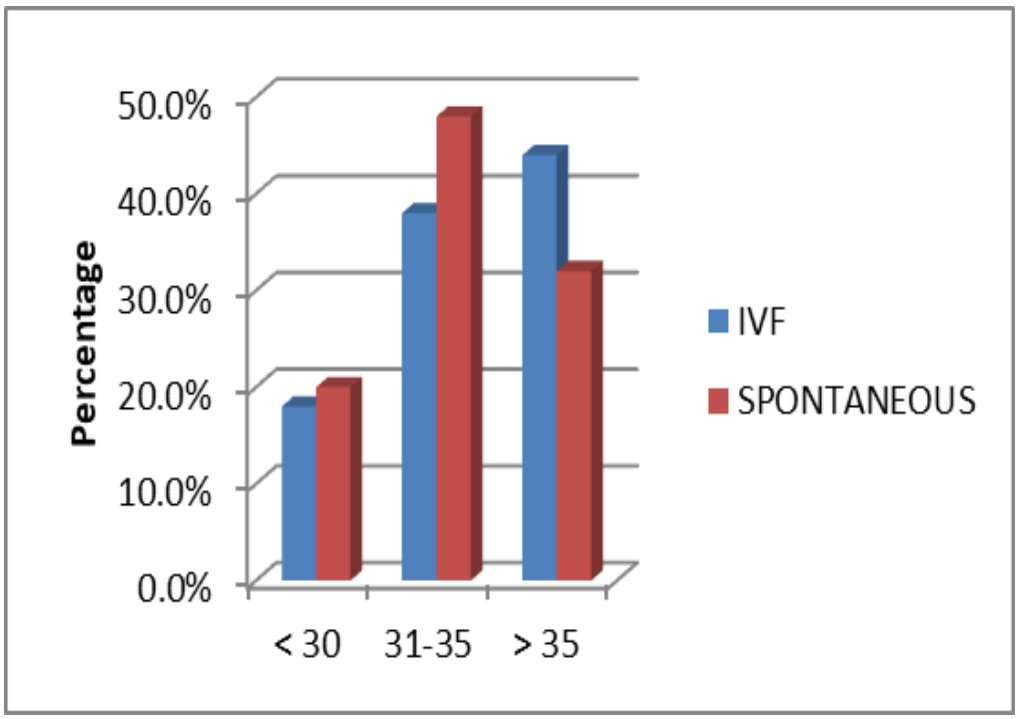

Figure 1: Distribution of study population according to age.

The age distribution in IVF group was 18%, 38% and 44% in age group of <30 years, 30-35 years and >35 years respectively. Mean age of IVF group was 36.4 years.

The age distribution in spontaneous group was 20%,48% and 32% in age group of <30 years, 30-35 years and >35 years respectively. Mean age of spontaneous group was 33.38 years.

IVF and spontaneous groups were matched by age (+_2 years) and p value was statistically insignificant.(p value>0.05)

TABLE 2: Distribution of study population according to education

	IVF		SPONTANEOUS		Total	Chi-square value	p-value
EDUCATION	No. of cases	%age	No. of cases	%age			
UNDER-GRADUATE	6	12.0%	16	32.0%	22	11.162	0.004
GRADUATE	27	54.0%	29	58.0%	56		
POST-GRADUATE	17	34.0%	5	10.0%	22		
Total	50	100.0%	50	100.0 %	100		

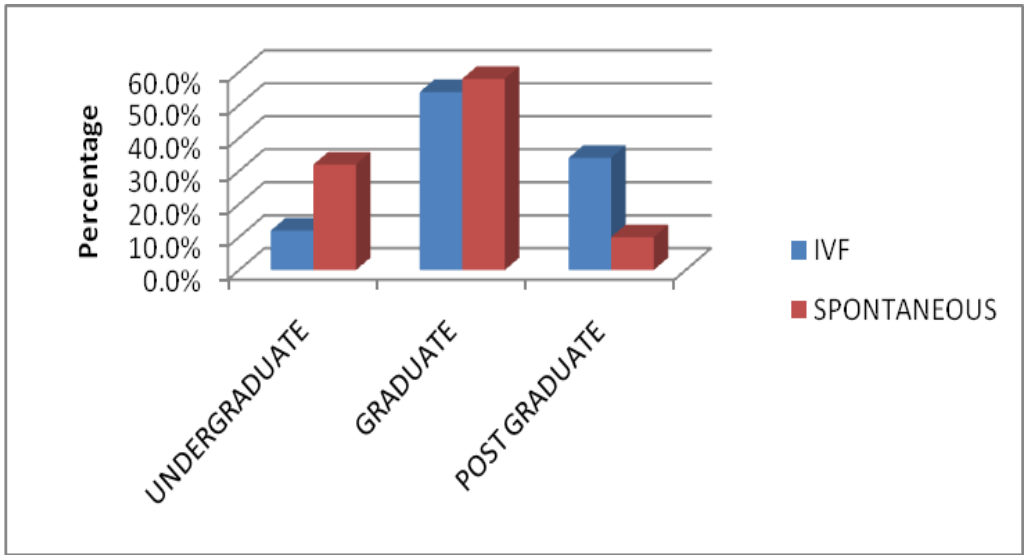

FIGURE2: Distribution of study population according to education

A majority of the patients were graduate (54% vs 58%) in IVF and spontaneous group.

Of the population 34% vs 10% were post graduate in IVF and spontaneous group.

Remaining 12% vs 32% were undergraduate in IVF and spontaneous group. This was statistically significant. (p value<0.05)

TABLE3: Distribution of study population according to socioeconomic status

	IVF		SPONTANEOUS		Total	Chi-square value	p-value
SOCIO-ECONOMIC STATUS	No. of cases	%age	No. of cases	%age			
LOWER	0	0.0%	2	4.0%	2	14.65	0.005
LOWER MIDDLE	10	20.0%	23	46.0%	33		
UPPER LOWER	2	4.0%	5	10.0%	7		
UPPER MIDDLE	27	54.0%	12	24.0%	39		
UPPER	11	22.0%	8	16.0%	19		
Total	50	100.0%	50	100.0%	100		

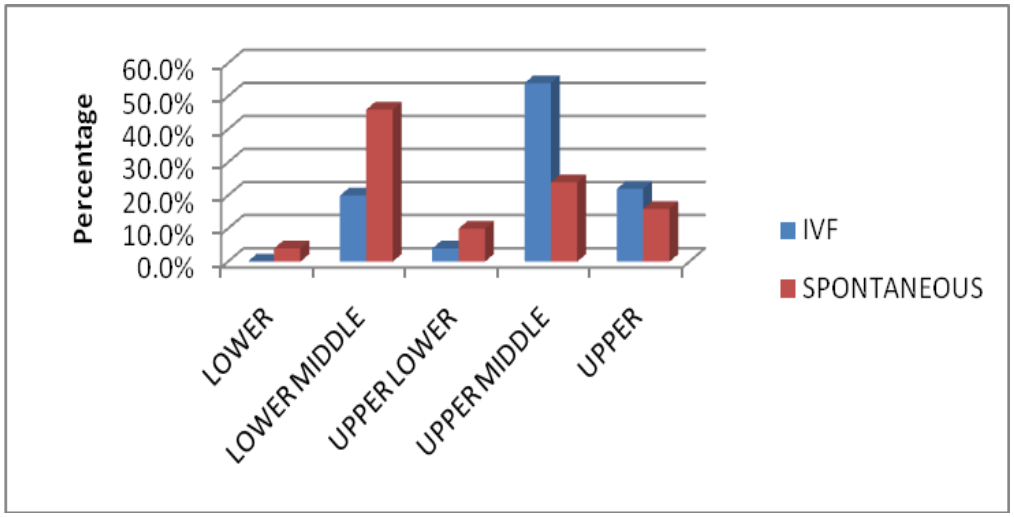

FIGURE3: Distribution of study population according to socioeconomic status.

The socioeconomic status of study population was decided according to modified kuppuswamy scale.

A majority of women in IVF group (54%) belonged to upper middle class followed by upper class (22%), lower middle class (20%) and upper lower class (4%). None of the patient in IVF group was part of lower class.

A majority of women in spontaneous group (46%) belonged to lower middle class followed by upper middle class (24%) and upper class (16%). Remaining 10% women in spontaneous group belonged to upper lower class and 4% were from lower class.

This was statistically significant. (p value<0.05)

TABLE4: Distribution of study population according to employment.

	IVF		SPONTANEOUS		Total	Chi-square value	p-value
OCCUPATION	No. of cases	%age	No. of cases	%age			
EMPLOYED	35	70.0%	17	34.0%	52	12.981	0.001
HOMEMAKER	15	30.0%	33	66.0%	48		
Total	50	100.0%	50	100.0%	100		

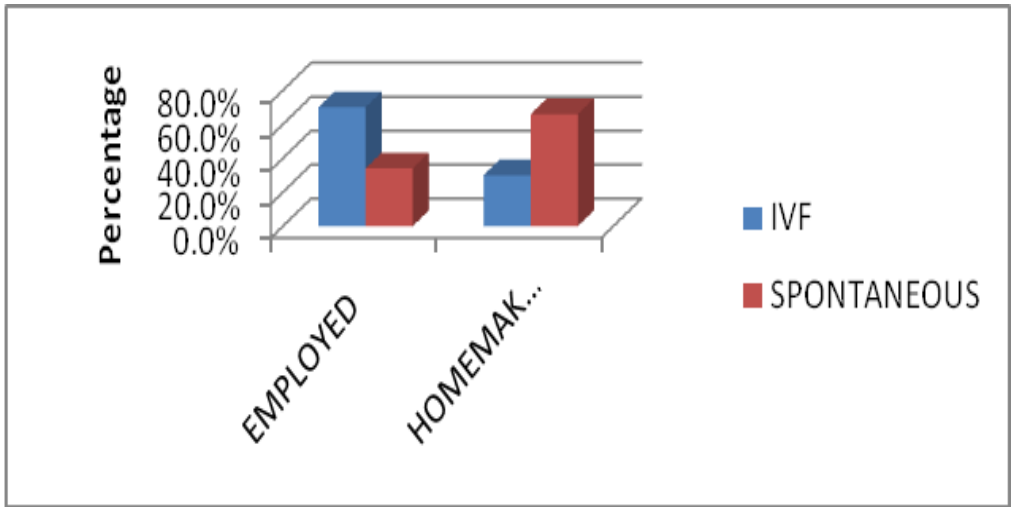

FIGURE4: Distribution of study population according to employment.

A majority of women (70%) in IVF group were employed and remaining 30% were homemaker.

Of the spontaneous group 66% women were homemaker and 34% women were employed.

This was statistically significant. (p value<0.05)

TABLE 5: Distribution of study population according to residential address.

	IVF		SPONTANEOUS		Total	Chi-square value	p-value
RESIDENTIAL ADDRESS	No. of cases	%age	No. of cases	%age			
RURAL	18	36.0%	25	50.0%	43	1.999	0.225
URBAN	32	64.0%	25	50.0%	57		
Total	50	100.0%	50	100.0%	100		

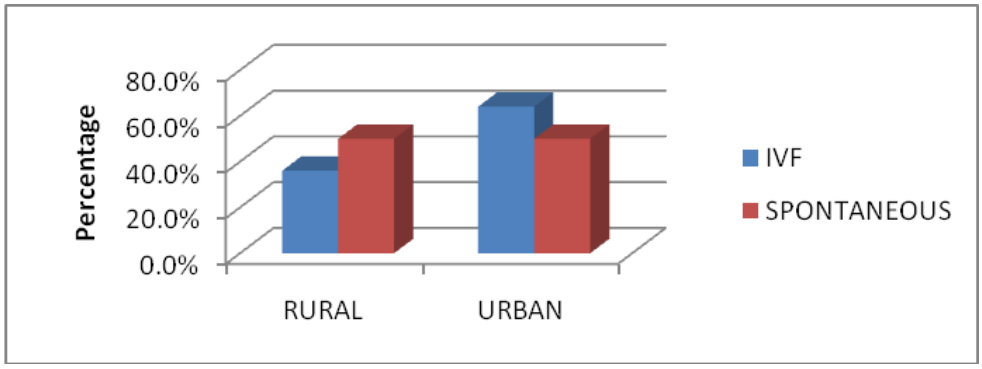

FIGURE 5: Distribution of study population according to residential address.

Of the population 64% in IVF group had their residential address in urban area, remaining 36% women were from rural area. There was equal distribution of women in urban and rural area in spontaneous group. This was statistically insignificant. (p value>0.05)

Table 6: Distribution of study population according to Body Mass Index (BMI) (Kg/m2).

	IVF		SPONTANEOUS		Total	Chi-square value	p-value
BMI (kg/m2)	No. of cases	%age	No. of cases	%age			
18.5-24.9 (NORMAL)	7	14.0%	23	46.0%	30	17.566	0.001
25-29.9 (OVERWEIGHT)	35	70.0%	27	54.0%	62		
> 30 (OBESE)	8	16.0%	0	0.0%	8		
Total	50	100.0%	50	100.0%	100		

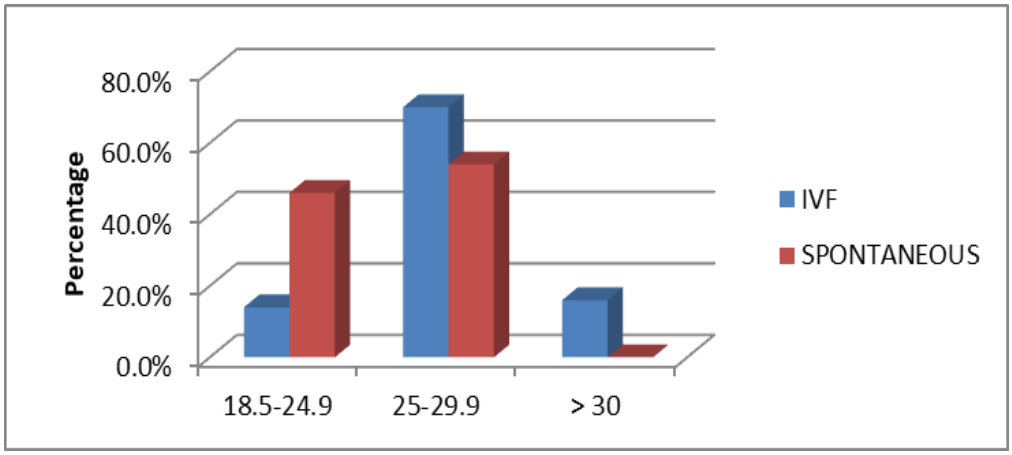

Figure6: Distribution of study population according to Body Mass Index (BMI) kg/m2.

There was BMI of 18.5-24.9 (normal) in 14% vs 46% , 25-29.9 (overweight) in 70% vs 54% and BMI >30 (obese) in 16% vs 0% in IVF vs spontaneous group.

This relationship was statistically significant with a p-value of <0.05.

Table7 : Mean Body Mass Index (kg/m2)

	IVF		SPONTANEOUS		Z	p-value
	Mean	SD	Mean	SD		
BMI (kg/m2)	27.49	2.52	25.13	1.94	5.244	0.001

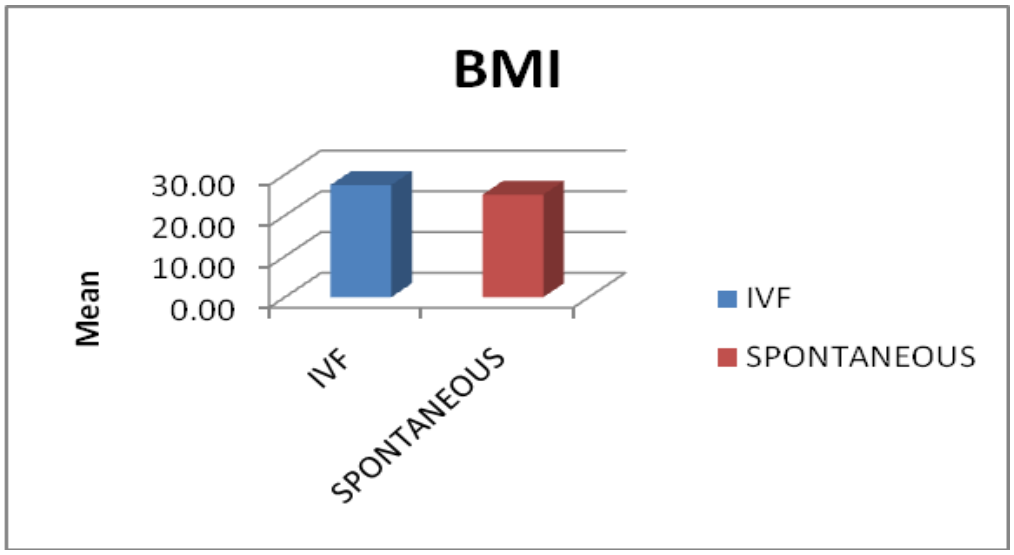

Figure7: Mean Body Mass Index (kg/m2)

Mean Body Mass Index (kg/m2) was 27.49 vs 25.13 in IVF and spontaneously conceived patients.

This relationship was statistically significant with a p-value of <0.05.

TABLE8: Distribution of study population according to substance abuse in wife and husband.

	IVF		SPONTANEOUS		TOTAL	CHISQUARE VALUE	P VALUE
SUBSTANCE ABUSE	No. of cases	%age	No. of cases	%age			
WIFE	5	10.0%	3	6.0%	8	0.543	0.715
HUSBAND	10	20.0%	5	10.0%	15	1.961	0.262
Total	50	100.0%	50	100.0%	100		

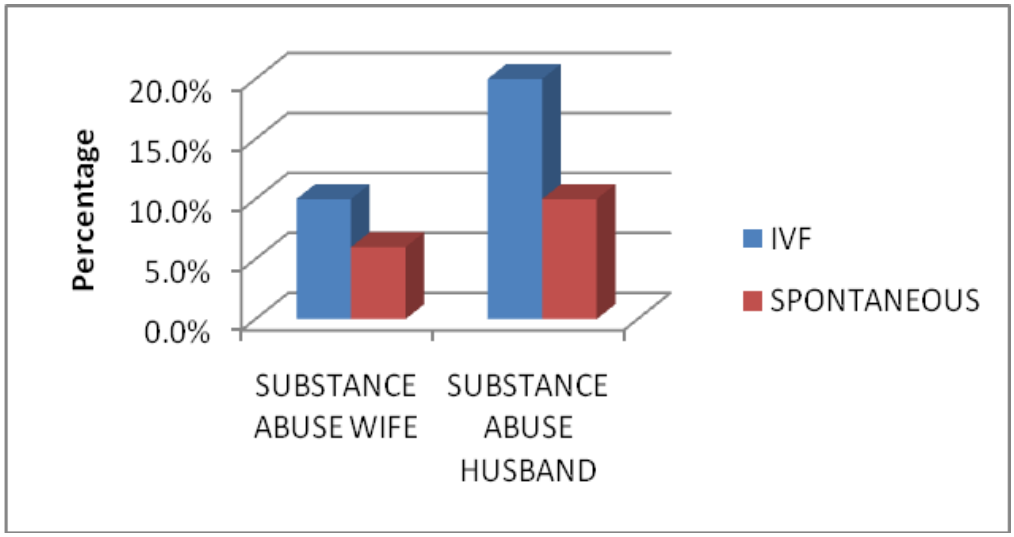

FIGURE8: Distribution of study population according to substance abuse in wife and husband

A majority of population had no history of substance abuse in both IVF and spontaneous groups.

Remaining 10% vs 6% women in IVF and spontaneous group had history of substance abuse. This was statistically insignificant. (p value>0.05)

Of the population 20% vs 10% men in IVF and spontaneous group had history of substance abuse. This was statistically insignificant. (p value>0.05)

Table 9: Distribution of study population according to duration of married life.

	IVF		SPONTANEOUS		Total	Chi-square value	p-value
DURATION OF MARRIED LIFE (YEARS)	No. of cases	%age	No. of cases	%age			
< 5	6	12.0%	34	68.0%	40	32.667	0.001
> 5	44	88.0%	16	32.0%	60		
Total	50	100.0%	50	100.0%	100		

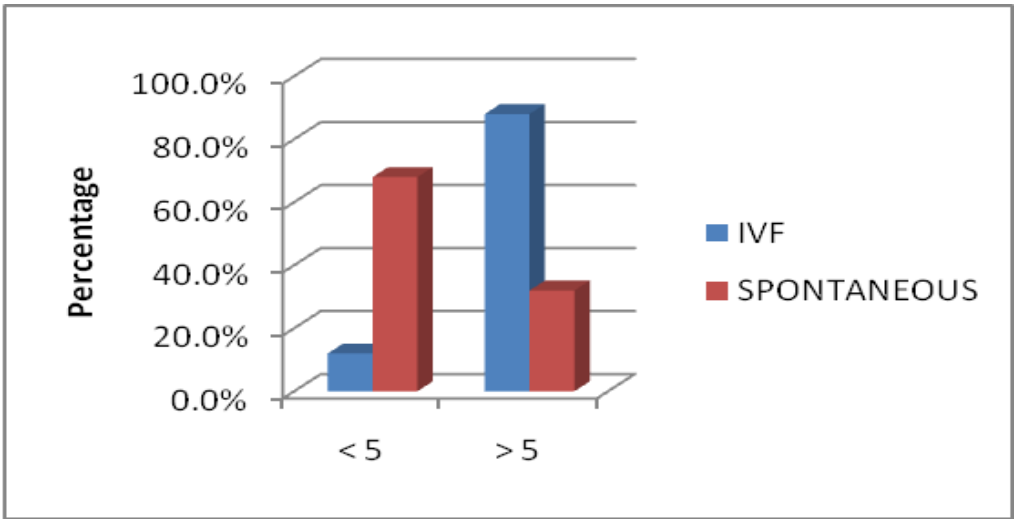

Figure 9: Distribution of study population according to duration of married life.

Forty four patients (88%) vs sixteen patients (32%) from IVF and spontaneous group conceived after 5 years of marriage.

Six patients (12%) vs thirty four patients (68%) from IVF and spontaneous group conceived before 5 years of marriage.

This relationship was statistically significant with a p-value of <0.05.

Table10: Mean years of marriage

	IVF		SPONTANEOUS		Z	p-value
	Mean	SD	Mean	SD		
YEARS OF MARRIAGE	7.60	2.85	3.80	1.96	7.770	0.001

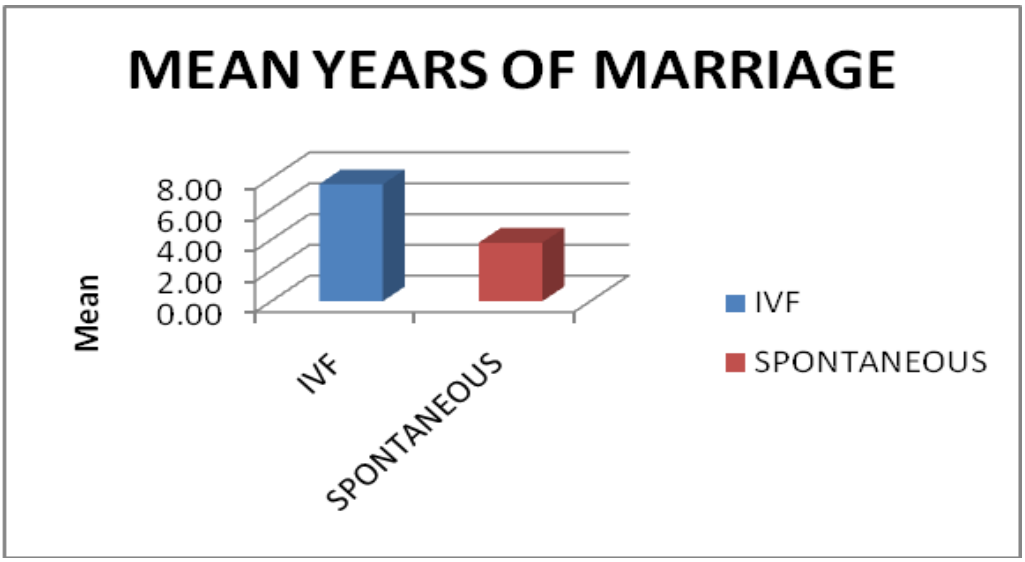

Figure10: Mean years of marriage

Mean years of marriage was 7.60 years vs 3.8 years in IVF and spontaneously conceived patients.

This relationship was statistically significant with a p-value of <0.05.

Table11: Distribution of study population according to booked status.

	IVF		SPONTANEOUS		Total	Chi-square value	p-value
BOOKED	No. of cases	%age	No. of cases	%age			
DMCH	40	80.0%	37	74.0%	77	0.508	0.476
OUTSIDE	10	20.0%	13	26.0%	23		
Total	50	100.0%	50	100.0%	100		

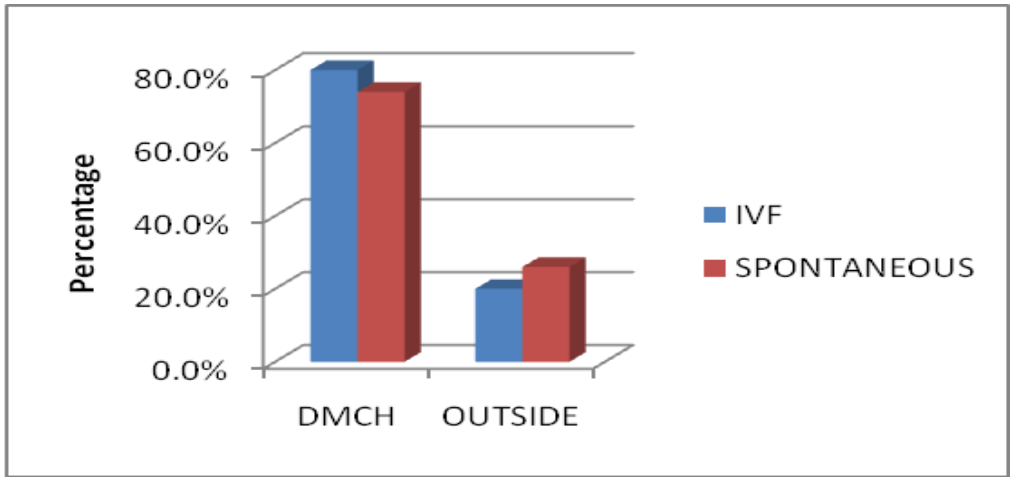

Figure 11 : Distribution of study population according to booked status.

A majority of patients (80% vs 74%) were booked at DMCH in IVF and spontaneous group.

Remaining 20% vs 26% patients in IVF and spontaneous group were booked outside.

This was statistically insignificant. (p value >0.05)

Table12: Distribution of study population according to gravidity.

	IVF		SPONTANEOUS		Total	Chi-square value	p-value
GRAVIDITY	No. of cases	%age	No. of cases	%age			
GRAVIDA 1	22	44.0%	23	46.0%	45	8.33	0.597
GRAVIDA 2	20	40.0%	20	40.0%	40		
GRAVIDA3	6	12.0%	5	10.0%	11		
GRAVIDA 4 OR MORE	2	4.0%	2	4.0%	4		
Total	50	100.0%	50	100.0%	100		

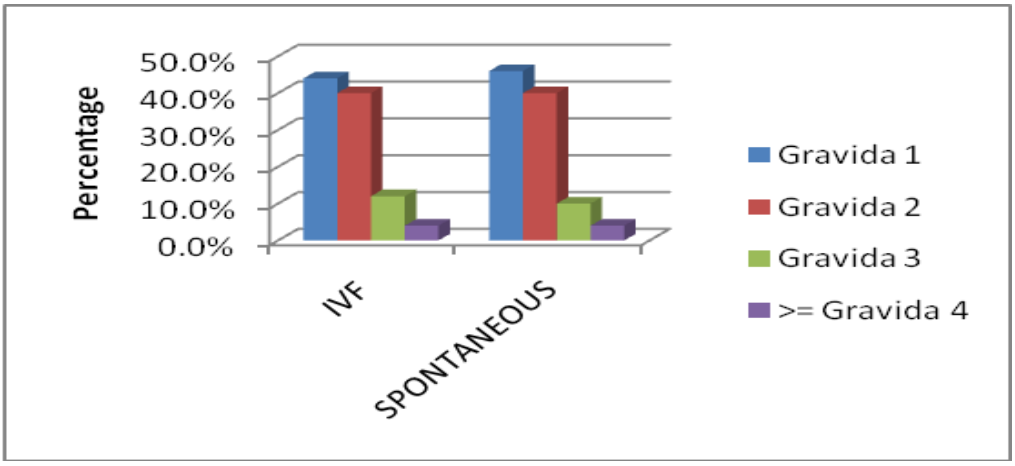

Figure12: Distribution of study population according to gravidity.

Majority of patients were gravida1 (44%) and gravida2 (40%) in IVF conceived group.

Remaining 12% and 4% patients in IVF group were gravida 3 and gravida 4 or more respectively.

Similarly in spontaneously conceived group, majority of patients were gravida1 (46%) and gravida2 (40%). Remaining 10% and 4% were gravida 3 and gravida4 or more respectively.

It was statistically insignificant. (pvalue>0.05)

Table13: Distribution of study population according to parity.

	IVF		SPONTANEOUS		Total	Chi-square value	p-value
Parity	No. of cases	%age	No. of cases	%age			
0	34	68.0%	31	62.0%	65	0.472	0.789
1	14	28.0%	16	32.0%	30		
2 or more	2	4.0%	3	6.0%	5		
Total	50	100.0%	50	100.0%	100		

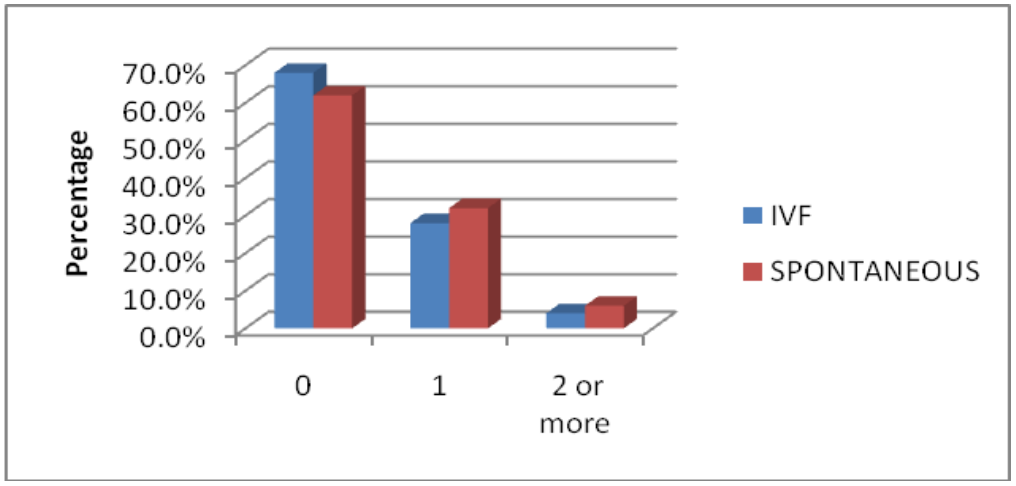

Figure13: Distribution of study population according to parity.

Majority of the patients 68% vs 62% had zero parity in IVF and spontaneous group.

Of the population 28% vs 32% had parity of one and remaining 4% vs 6% had two or more parity in IVF and spontaneous group respectively.

Both IVF and spontaneous groups were matched by parity, so it was statistically insignificant. (p value>0.05)

Table 14: Distribution of IVF population according to the indication for IVF.

	IVF	
INDICATION FOR IVF	No. of cases	%age
ENDOMETRIOSIS	14	28.0%
MALE FACTOR	10	20.0%
OVULATORY DYSFUNCTION	8	16.0%
TUBAL FACTORS	11	22.0%
UNEXPLAINED	7	14.0%
Total	50	100.0%

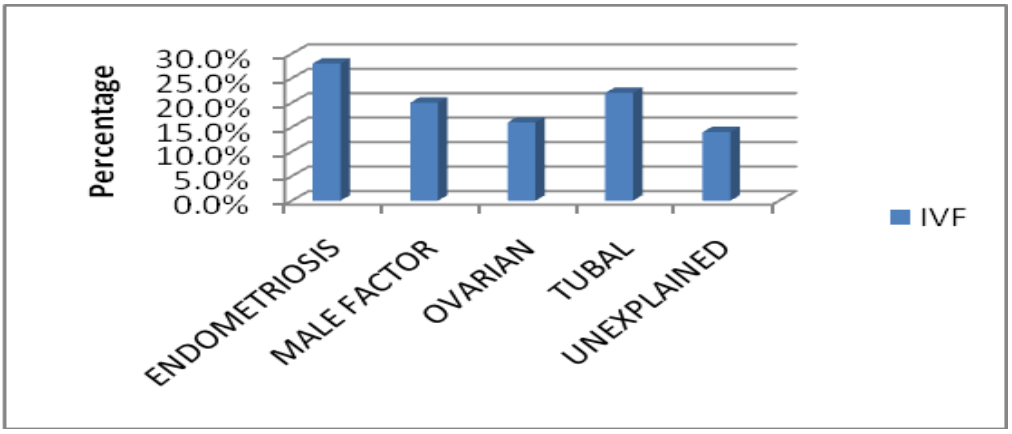

Figure14: Distribution of IVF population according to the indication for IVF.

The most common indication for IVF in this study was endometriosis (28%).

Other factors were tubal factors in 22%, male factor in 20% and ovulatory dysfunction in 16 % IVF patients.

14% IVF patients had unexplained infertility. Fifty patients among spontaneous group had no history of endometriosis, ovulatory dysfunction, male factor or tubal factors of infertility.

TABLE 15: Distribution of IVF population according to type of egg used (donor/self)

	IVF	
Egg	No. of cases	%age
DONOR	5	10.0%
SELF (WIFE)	45	90.0%
Total	50	100.0%

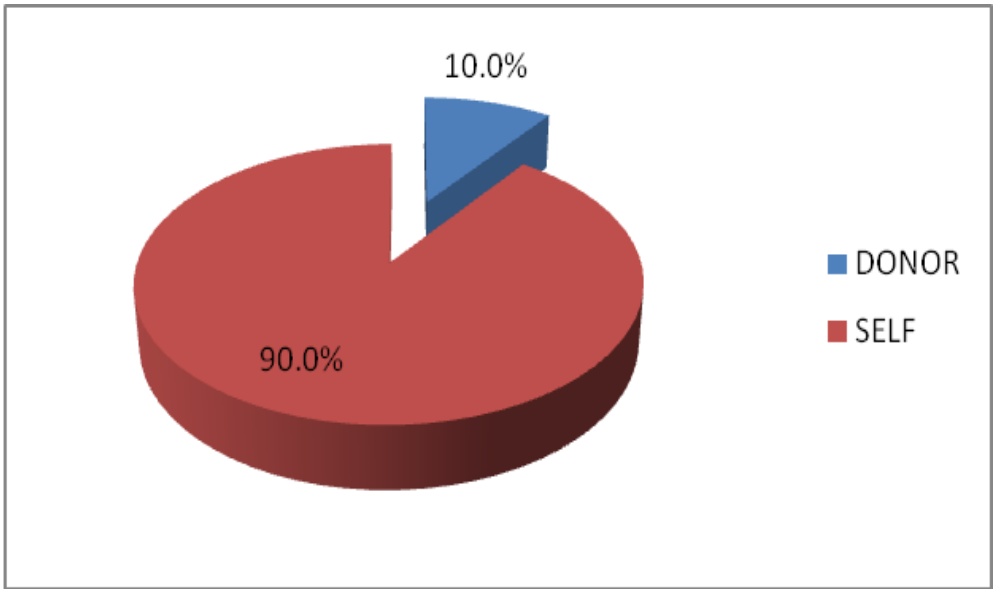

FIGURE15: Distribution of IVF population according to type of egg used (donor/self)

In majority of IVF cases (90%) self egg was used, remaining 10% had taken donor egg.

TABLE 16: Distribution of IVF population according to type of sperm used (donor/self)

SPERM	No. of cases	%age
DONOR	7	14.0%
SELF (HUSBAND)	43	86.0%
Total	50	100.0%

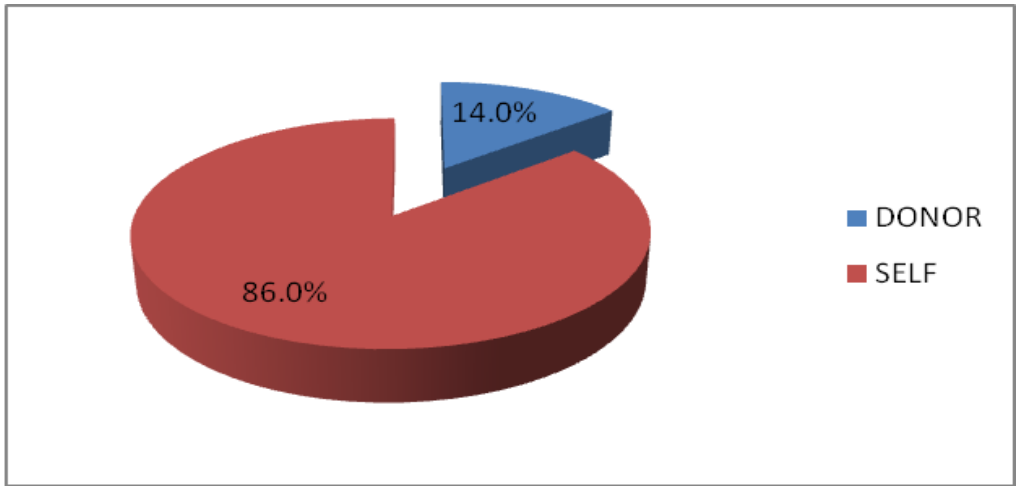

Figure16: Distribution of IVF population according to type of sperm used (donor/self)

In 86% of cases, husband sperm was used in IVF group, remaining 14% had taken donor sperm.

Table17: Distribution of IVF population according to the number of embryos transferred.

EMBRYOS TRANSFERRED	No. of cases	%age
1	14	28.0%
2	36	72.0%
Total	50	100.0%

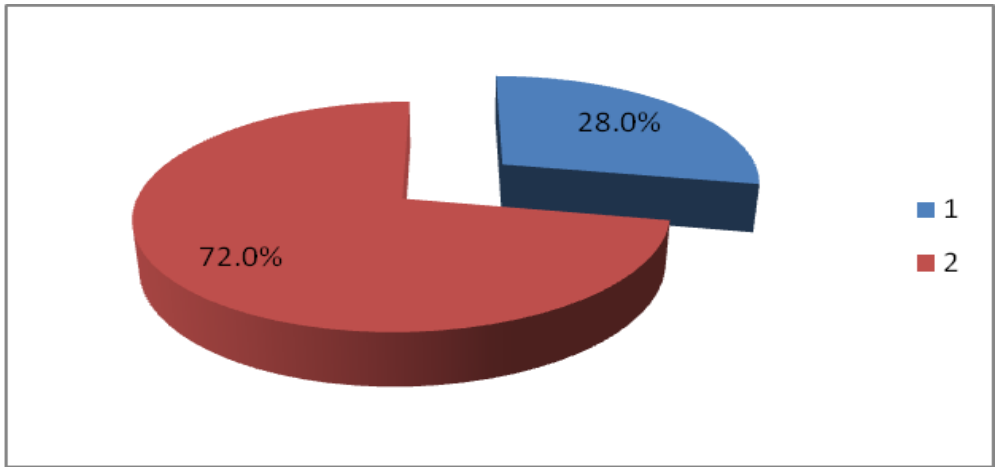

Figure17: Distribution of IVF population according to the number of embryos transferred.

A majority of women (72%) in IVF group had double embryo transfer, remaining 28% women had single embryo transfer.

Table 18: Distribution of study population according to medical comorbidities.

	IVF		SPONTANEOUS		Total	Chi-square value	p-value
MEDICAL COMORBIDITY	No. of cases	%age	No. of cases	%age			
CHRONIC HYPERTENSION	4	8.0%	1	2.0%	5	10.654	0.059
PREGESTATIONAL DM	2	4.0%	0	0.0%	2		
PREGESTATIONAL DM,HYPOTHYROIDISM	2	4.0%	0	0.0%	2		
HYPOTHYROIDISM	14	28.0%	9	18.0%	23		
OTHERS	5	10.0%	3	6.0%	8		
NONE	23	46.0%	37	74.0%	60		
Total	50	100.0%	50	100.0%	100		

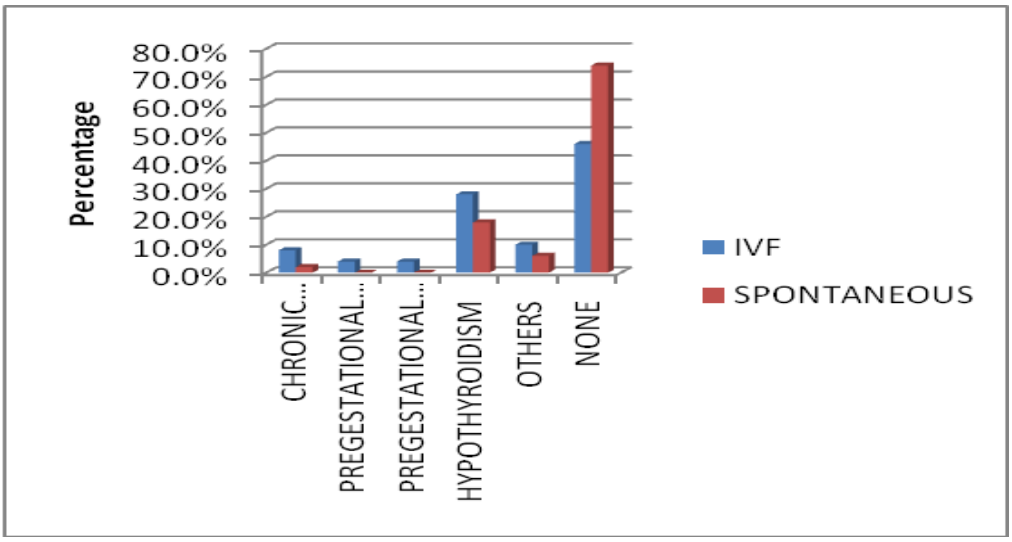

Figure 18: Distribution of study population according to medical comorbidities.

The medical comorbidities were not identified in 46% vs 76% in IVF and spontaneously conceived patients.

The most common medical history was hypothyroidism (28% vs 18%) in IVF and spontaneously conceived patients. Chronic hypertension (8% vs 2%), pregestational diabeties mellitus (4% vs 0%) and pregestational diabeties mellitus plus hypothyroidism (4% vs 0%) in IVF vs spontaneous group.

Others were history of tuberculosis (0% vs 2%), rheumatoid arthritis(4% vs 2%) ,sjogren's syndrome (2% vs 2%) ,ulcerative colitis (2% vs 0%) , history of cerebral venous thrombosis (2% vs 0%) in IVF vs spontaneous group.

This was statistically insignificant. (p value >0.05).

Table19: Distribution of study population according to surgical history

	IVF		SPONTANEOUS		Total	Chi-square value	p-value
SURGICAL HISTORY	No. of cases	%age	No. of cases	%age			
ABDOMINAL MYOMECTOMY	1	2.0%	0	0.0%	1	7.948	0.242
LAP APPENDICECTOMY	3	6.0%	4	8.0%	7		
LAP MYOMECTOMY	1	2.0%	0	0.0%	1		
LAP SALPINGECTOMY	1	2.0%	0	0.0%	1		
LAP CYSTECTOMY	4	8.0%	0	0.0%	4		
OTHERS	3	6.0%	2	4.0%	5		
NONE	37	74.0%	44	88.0%	81		
Total	50	100.0%	50	100.0%	100		

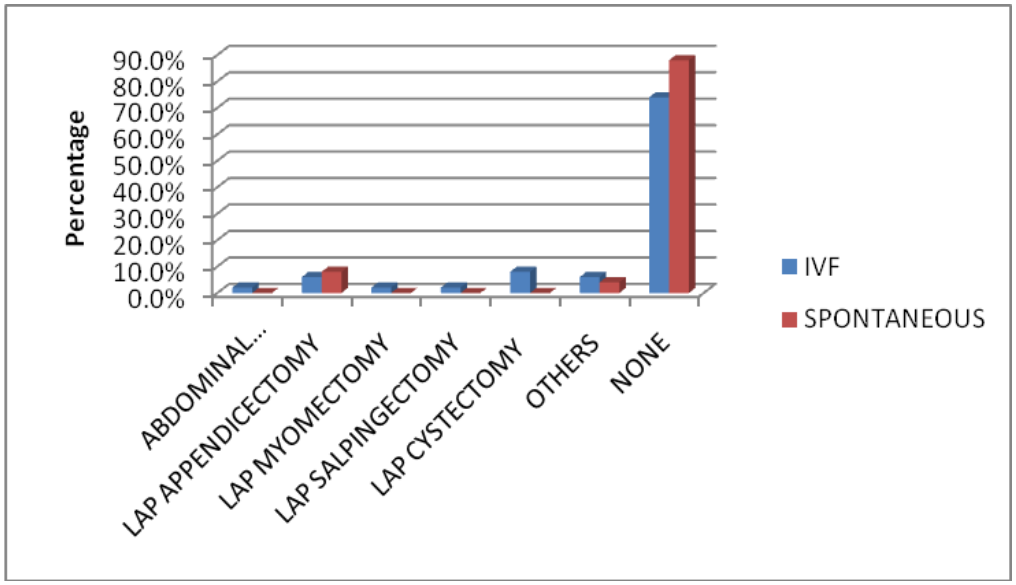

Figure19 : Distribution of study population according to surgical history

Most common surgical history was laproscopic ovarian cystectomy due to endometriosis (8%) in IVF group and laproscopic appendicectomy (8%) in spontaneously conceived group.

History of lap cystectomy (8% vs 0%) , Lap appendicectomy (6% vs 8%), abdominal myomectomy (2% vs 0%), lap myomectomy (2% vs 0%), lap salpingectomy (2% vs 0%) in IVF and spontaneous group.

Some patients had other surgical histories example- hysteroscopic polypectomy (6% vs 0%), breast fibroadenoma excision (0% vs 4%) in IVF vs spontaneous group.

There was no surgical history in 74% vs 88% in IVF and spontaneously conceived patients.

This was statistically insignificant. (p value >0.05)

Table 20: Distribution of study population according to the number of multiple pregnancies

	IVF		SPONTANEOUS		Total	Chi-square value	p-value
MULTIPLE PREGNANCIES	No. of cases	%age	No. of cases	%age			
SINGLETON	37	74.0%	45	90.0%	82	4.293	0.038
TWINS+TRIPLETS	13	26.0%	5	10.0%	18		
Total	50	100.0%	50	100.0%	100		

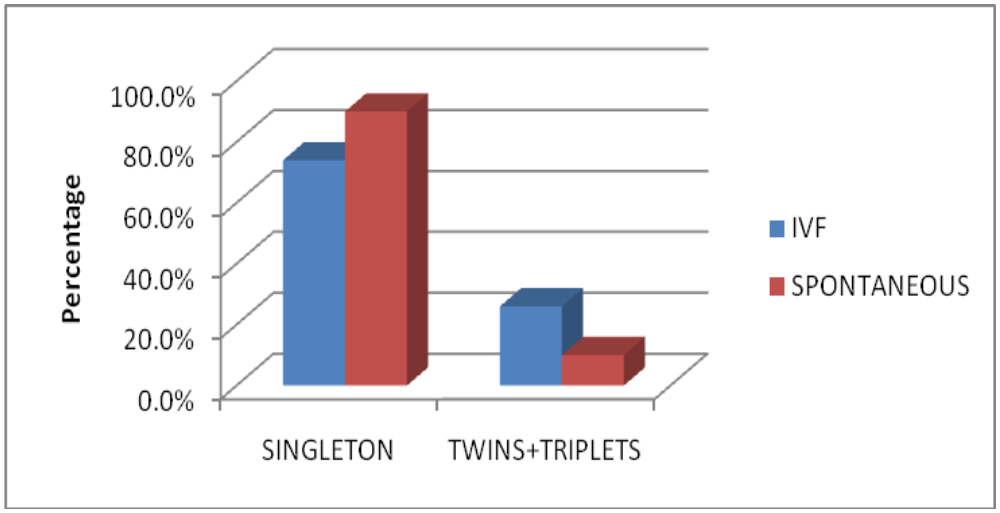

Figure20: Distribution of study population according to the number of multiple pregnancies

Singleton pregnancy was observed in 37 vs 45 patients (74% vs 90%) in IVF and spontaneously conceived patients.

Of the population 13 vs 5 patients (26% vs 10%) had multiple pregnancy in IVF and spontaneous group.

Among multiple pregnancies, IVF group had 11 twins and 2 triplet pregnancies while spontaneous group had 5 twins and no triplet pregnancy.

This was statistically significant with a p-value of <0.05.

Table 21: Distribution of study population according to the antepartum complications during pregnancy.

	IVF		SPONTANEOUS		Total	Chi-square value	p-value
COMPLICATIONS	No. of cases	%age	No. of cases	%age			
SUBCLINICAL HYPOTHYROID	5	10.0%	4	8.0%	9	0.121	0.728
GDM	15	30.0%	4	8.0%	19	7.784	0.005
GESTATIONAL HTN/ P.E	18	36.0%	6	12.0%	24	7.895	0.009
PPROM	10	20.0%	5	10.0%	18	1.941	0.164
OLIGOHYDRAMNIOS	5	10.0%	4	8.0%	9	0.122	0.727
PLACENTA PREVIA	6	12.0%	3	6.0%	9	1.088	0.297
APH	4	8.0%	2	4.0%	6	0.702	0.402
ECLAMPSIA	2	4.0%	1	2.0%	3	0.344	0.558
ICP	7	14.0%	3	6.0%	10	1.778	0.318
POLYHYDRAMNIOS	2	4.0%	0	0.0%	2	2.041	0.495
PRETERM LABOUR	12	24.0%	5	10.0%	17	3.473	0.108

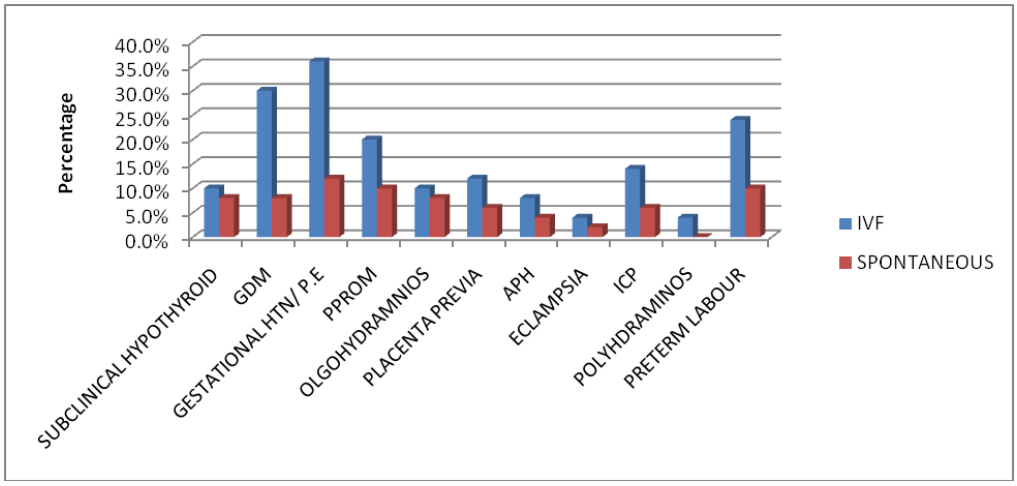

Figure21: Distribution of study population according to the antepartum complications during pregnancy.

The most common antepartum complication was pre eclampsia (36% vs 12%) in IVF and spontaneous group.

The incidence of pre eclampsia (36% vs 12%) and gestational diabeties mellitus (30% vs 8%) was significantly higher in IVF than spontaneous group. The p value was found to be <0.05 which was statistically significant.

However the incidence of preterm labour (24% vs 10%), pre term premature rupture of membranes (20% vs 10%), Intrahepatic cholestasis of pregnancy (14% vs 6%), placenta previa (12% vs 6%), subclinical hypothyroid (10% vs 8%), oligohydramnios (10% vs 8%), APH (8% vs 4%), eclampsia (4% vs 2%), polyhydramnios (4% vs 0%) did not differ between the two groups. The p value was found to be >0.05 which was statistically insignificant.

Table 22: Distribution of study population according to the intrapartum and post partum complications during pregnancy.

		IVF		SPONTANEOUS		Total	Chi-square value	p-value
		No. of cases	%age	No. of cases	%age			
INTRAPARTUM COMPLICATIONS	PLACENTA ACCRETA	0	0.0%	1	2.0%	1	2.000	0.368
	PRIMARY PPH	1	2.0%	0	0.0%	1		
	OTHERS	2	4.0%	1	2.0%	3	0.344	0.558
POST PARTUM COMPLICATIONS	RETAINED PLACENTA	1	2.0%	0	0.0%	1	2.041	0.360
	POST PARTUM DM	5	10.0%	2	4.0%	7	1.382	0.436
	CHRONIC HTN	6	12.0%	1	2.0%	7	3.84	0.112
	PUERPERAL SEPSIS	3	6.0%	1	2.0%	4	1.042	0.617
	OTHERS	2	4.0%	1	2.0%	3	0.344	0.558

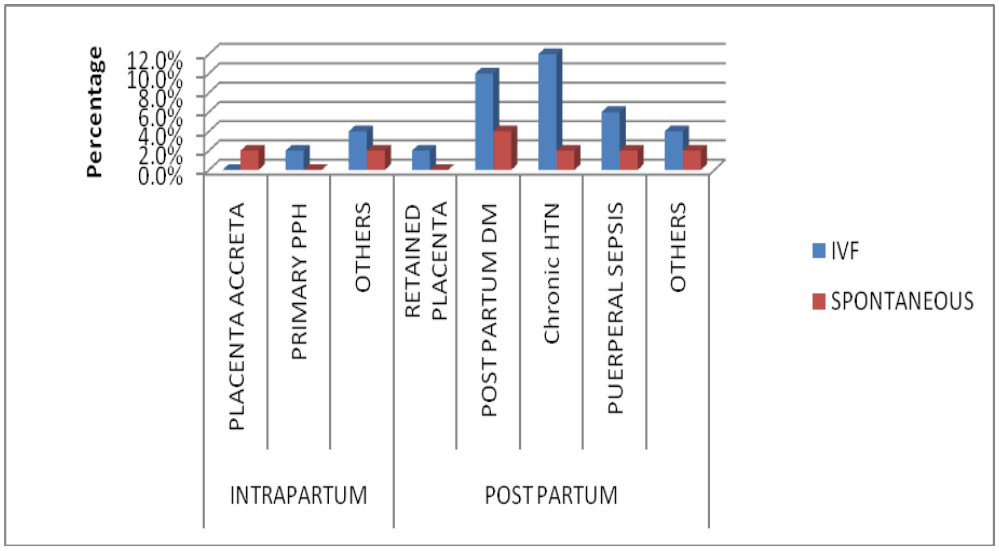

Figure 22: Distribution of study population according to the intrapartum and post partum complications during pregnancy.

The risk of intrapartum complications like primary post partum hemorrhage (2% vs 0%), placenta accreta (0% vs 2%) was not different between IVF and spontaneous group. The p value was found to be >0.05 which was statistically insignificant.

The risk of post partum complications like chronic hypertension (12% vs 2%), post partum diabeties mellitus (10% vs 4%), puerperal sepsis(6% vs 2%) , retained placenta (2% vs 0%) was not different between IVF and spontaneous group. The p value was found to be >0.05 which was statistically insignificant.

Some other intrapartum complications were shoulder dystocia (2% vs 0%) , perineal tears (2% vs 2%) and other post partum complications were surgical site infection (2% vs 2%), rectus sheath hematoma. (2% vs 0%) in IVF vs. spontaneous group. The p value was found to be >0.05 which was statistically insignificant.

Table 23: Distribution of study population according to the period of gestation at delivery.

	IVF		SPONTANEOUS		Total	Chi-square value	p-value
PERIOD OF GESTATION AT DELIVERY	No. of cases	%age	No. of cases	%age			
< 34 WEEKS (EARLY PRETERM)	15	30.0%	7	14.0%	22	13.641	0.001
34-37 WEEKS (LATE PRETERM)	24	48.0%	14	28.0%	38		
> 37 WEEKS (TERM)	11	22.0%	29	58.0%	40		
TOTAL	50	100%	50	100%	100		

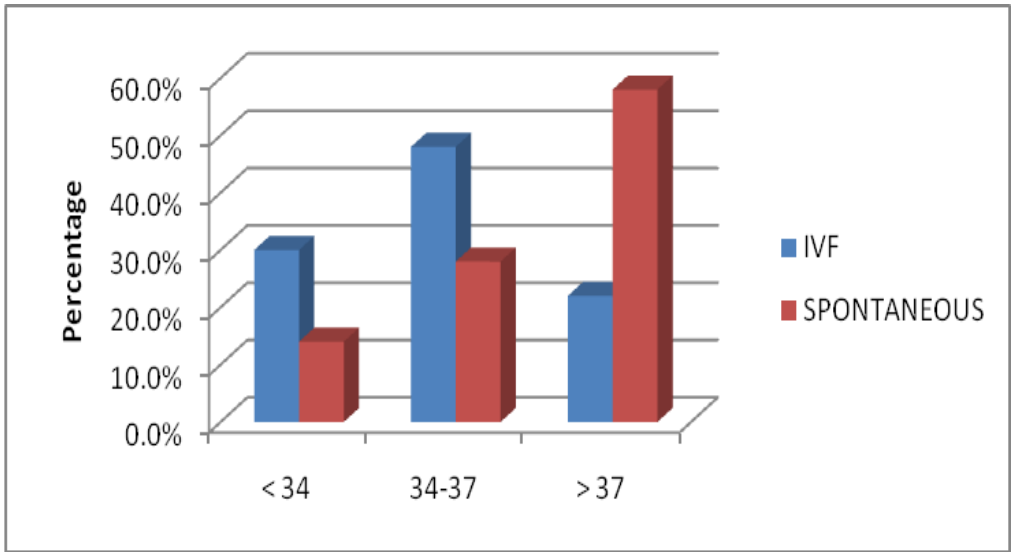

Figure 23: Distribution of study population according to the period of gestation at delivery.

The distribution of period of gestation at delivery in IVF and spontaneous group was 30% vs 14% at <34 weeks (early preterm), 48% vs 28% at 34-37 weeks (late preterm) and 22% vs 58% at >37 weeks(term).

The difference was statistically significant with p value <0.05.

Table 24 : Distribution of study population according to the mode of delivery.

	IVF		SPONTANEOUS		Total	Chi-square value	p-value
MODE	No. of cases	%age	No. of cases	%age			
LSCS	39	78.0%	20	40.0%	59	14.927	0.001
VAGINAL DELIVERY	11	22.0%	30	60.0%	41		
Total	50	100.0%	50	100.0%	100		

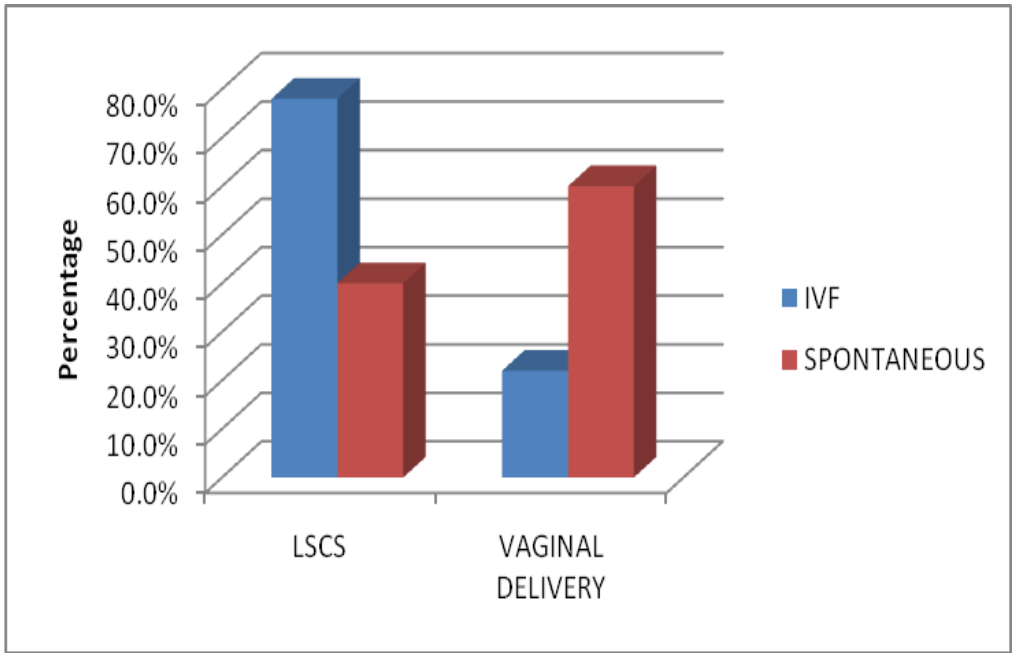

Figure 24: Distribution of study population according to the mode of delivery.

Mode of delivery was lower segment cesarian section in 78% vs 40% in IVF and spontaneously conceived group, whereas 22% vs 60% in IVF and spontaneous group had vaginal delivery.

The p value was <0.05 which was statistically significant.

Table 25: Distribution of study population according to the indication for cesarean section.

Thirty nine out of 50 IVF conceived patients and 20 out of 50 spontaneously conceived patients had cesarian section.

	IVF		SPONTANEOUS		
INDICATION OF CESARIAN SECTION	No. of cases	%age	No. of cases	%age	TOTAL
ABNORMAL DOPPLER	2	5.1%	1	5.0%	3
ABNORMAL DOPPLER PLUS FETAL DISTRESS	2	5.1%	1	5.0%	3
APH + FETAL DISTRESS	4	10.3%	2	10.0%	6
DETERIORATING MATERNAL CONDITION	6	15.4%	1	5.0%	7
FETAL DISTRESS	7	17.9%	2	10.0%	9
FGR+ FETAL DISTRESS	0	0.0%	2	10.0%	2
MECONIUM STAINED LIQUOR+FETAL DISTRESS	1	2.6%	0	0.0%	1
MALPRESENTATION	3	7.7%	5	25.0%	8
MATERNAL REQUEST	11	28.2%	3	15.0%	14
PLACENTA PREVIA TYPE4 IN LABOUR	2	5.1%	3	15.0%	5
SCAR TENDERNESS	1	2.6%	0	0.0%	1
TOTAL	39	100%	20	100%	59

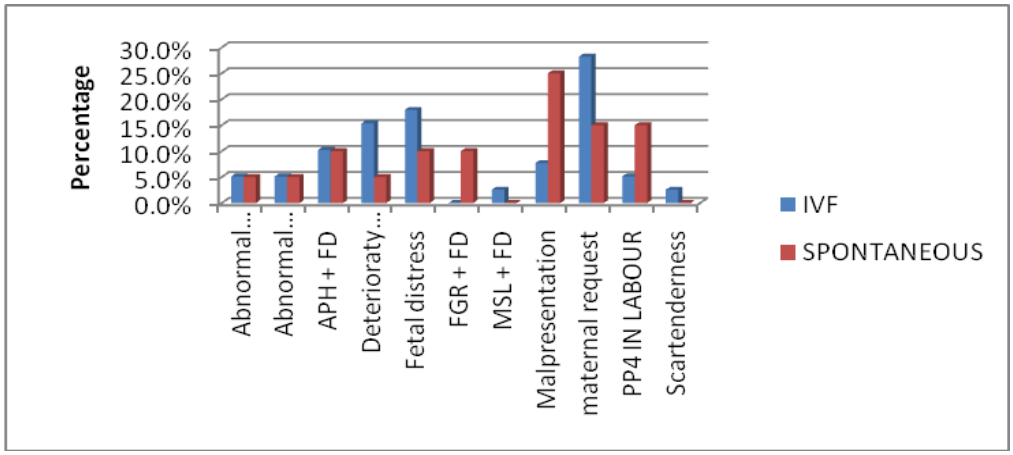

Figure 25: Distribution of study population according to the indication for cesarian section.

The most common indication of cesarian section was cesarian section on maternal request (28.2%) vs malpresentation (25%) in IVF and spontaneous group.

Other cesarian sections in IVF patients were due to fetal distress (17.9%), deteriorating maternal condition (15.4%), APH plus fetal distress (10.3%) , malpresentation (7.7%), abnormal doppler, placenta previa type4 in labour and abnormal doppler with fetal distress (5.1% each), meconium stained liquor plus fetal distress and scar tenderness (2.6% each).

Other indications of cesarian section in spontaneous group were maternal request and placenta previa type4 in labour(15% each), APH plus fetal distress,deteriorating maternal condition, fetal distress, FGR plus fetal distress (10%each) , abnormal Doppler , abnormal Doppler plus fetal distress and deteriorating maternal condition (5%each).

Table 26: Distribution of study population according to the sex of fetus.

Among 50 IVF conceived patients, there were 37 singleton, 11 twin and 2 triplet pregnancies

(Total number of neonates in IVF group= 65)

Among 50 spontaneously conceived patients, there were 45 singleton and 5 twin pregnancies.

(Total number of neonates in spontaneous group= 55)

	IVF		SPONTANEOUS		Total	Chi-square value	p-value
SEX	No. of cases	%age	No. of cases	%age			
FEMALE	34	53.1%	28	50.9%	55	0.023	0.879
MALE	31	48.4%	27	49.1%	65		
Total	65	101.6%	55	100.0%	120		

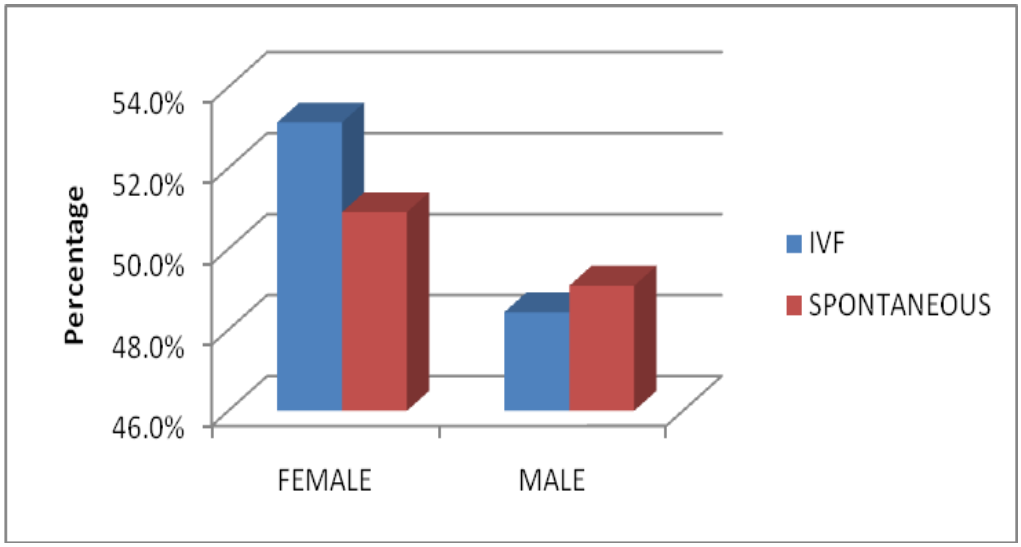

Figure 26: Distribution of study population according to the sex of fetus.

There were48.4 % vs 49.1% male babies in IVF and spontaneous group and 53.1% vs 50.9% female babies in IVF and spontaneous group.

This relationship was found to be statistically insignificant with a p-value of >0.05.

Table 27: Distribution of study population according to the perinatal complications

	IVF		SPONTANEOUS		Total	Chi-square value	p-value
PERINATAL COMPLICATIONS	No. of cases	%age	No. of cases	%age			
PRETERM < 37 WEEKS	39	60.0%	21	38.2%	60	5.625	0.018
FGR	16	24.6%	5	9.1%	21	4.932	0.026
IUFD	2	3.1%	1	1.8%	3	0.192	0.661
CONGENTIAL ANOMALIES	2	3.1%	0	0.0%	2	1.707	0.91
NICU ADMISSIONS	45	69.2%	22	40.0%	67	10.237	0.001
RESPIRATORY DISTRESS SYNDROME	28	43.1%	12	21.8%	40	6.009	0.014
APGAR SCORE 1 MIN < 7	15	23.1%	6	10.9%	21	3.029	0.082
APGAR SCORE 5 MIN < 7	8	12.3%	3	5.5%	11	1.666	0.197

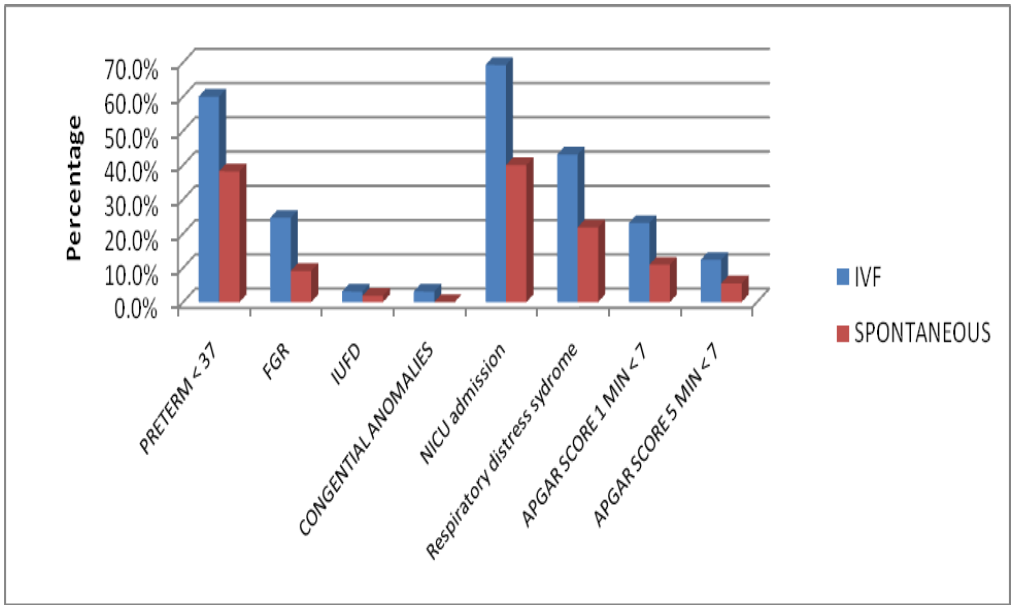

Figure 27: Distribution of study population according to the perinatal complications

There were 60 % vs 38.2% preterm babies in IVF and spontaneous group. This relationship was statistically significant. (p value<0.05).

Fetal growth restriction (FGR) was observed in 24.6% vs 9.1% fetus in IVF and spontaneous pregnancies. This was statistically significant (p value<0.05).

The risk of other perinatal complications like congenital fetal anomalies (3.1% vs 0%) and intrauterine fetal demise (3.1% vs 1.8%) in IVF and spontaneous group was not statistically significant. (p value >0.05)

There were 69.2 % vs 40% NICU admissions and 43.1% vs 21.8% incidence of respiratory distress syndrome in IVF and spontaneous group. This relationship was statistically significant. (p value <0.05).

APGAR score at 1 minutes was less than 7 in 23.1% vs 10.9% in IVF and spontaneous group . At 5 minutes, it was less than 7 in 12.3 % vs 5.5% in IVF and spontaneous group. It was statistically insignificant. (p value >0.05).

Table 28: Distribution of study population according to the neonatal birth weight

Among 50 IVF conceived patients, there were 37 singleton, 11 twin and 2 triplet pregnancies

(Total number of neonates in IVF group= 65)

Among 50 spontaneously conceived patients, there were 45 singleton and 5 twin pregnancies.

(Total number of neonates in spontaneous group= 55)

	IVF		SPONTANEOUS		Total	Chi-square value	p-value
BIRTH WEIGHT (KG)	No. of cases	%age	No. of cases	%age			
< 1.5	16	24.6%	2	3.6%	18	22.093	0.001
1.6-2.0	22	33.8%	9	16.4%	31		
>2.0-2.5	15	23.1%	16	29.1%	31		
> 2.5	12	18.5%	28	50.9%	40		
Total	65	100.0%	55	100.0%	120		

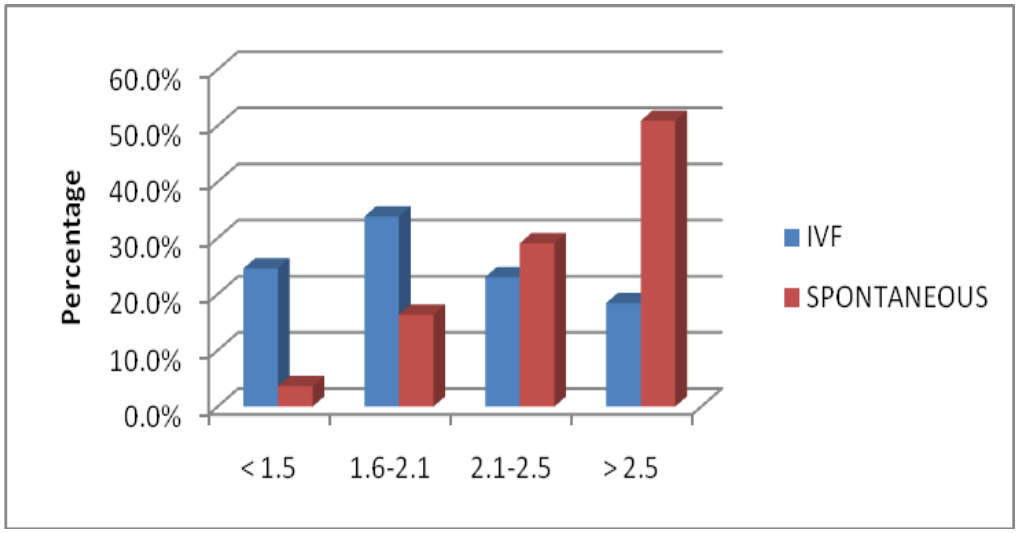

Figure 28: Distribution of study population according to the neonatal birth weight

A total of 24.6% vs 3.6% neonates in IVF and spontaneous group had birth weight of <1.5kg and 33.8% vs 16.4% neonates in IVF and spontaneous group had birth weight of 1.6-2kg.

A total of 23.1% vs 29.1% neonates in IVF and spontaneous group had neonatal birth weight >2.0kg-2.5kg and 18.5% vs 50.9% neonates in IVF and spontaneous group had neonatal birth weight >2.5kg.

IVF conceived patients had low birth weight neonates compared to spontaneously conceived patients and it was statistically significant. (p value <0.05)

Table 29: Mean neonatal birth weight.

	IVF		SPONTANEOUS		Z	p-value
	Mean	SD	Mean	SD		
BIRTH WEIGHT (KG)	1.88	0.77	2.50	0.54	-4.96	0.001

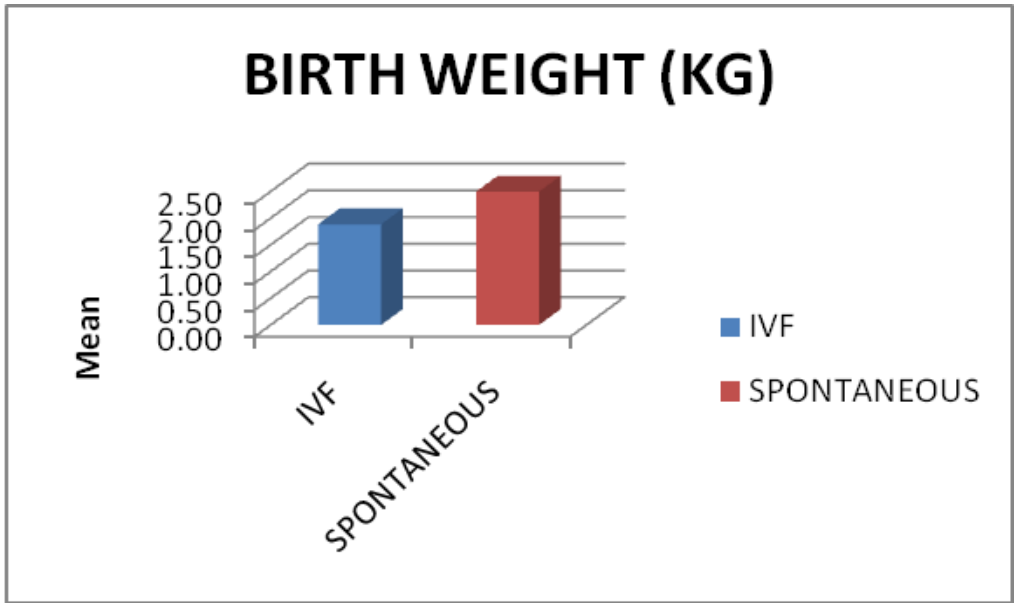

Figure 29: Mean neonatal birth weight.

Mean neonatal birth weight was 1.88kg vs 2.50 kg in IVF vs spontaneously conceived patients.

This relationship was statistically significant. (p value <0.05)

Table 30: Comparison of mean neonatal birth weight in singleton,twins and triplets.

	IVF		SPONTANEOUS		Z	p-value
	Mean	SD	Mean	SD		
BIRTH WEIGHT IN SINGLETON	2.22	.698	2.63	.490	-3.102	0.003
BIRTH WEIGHT IN TWINS	1.55	.570	1.90	.350	-1.757	0.089
BIRTH WEIGHT IN TRIPLETS	.85	.266	-	-	-	-

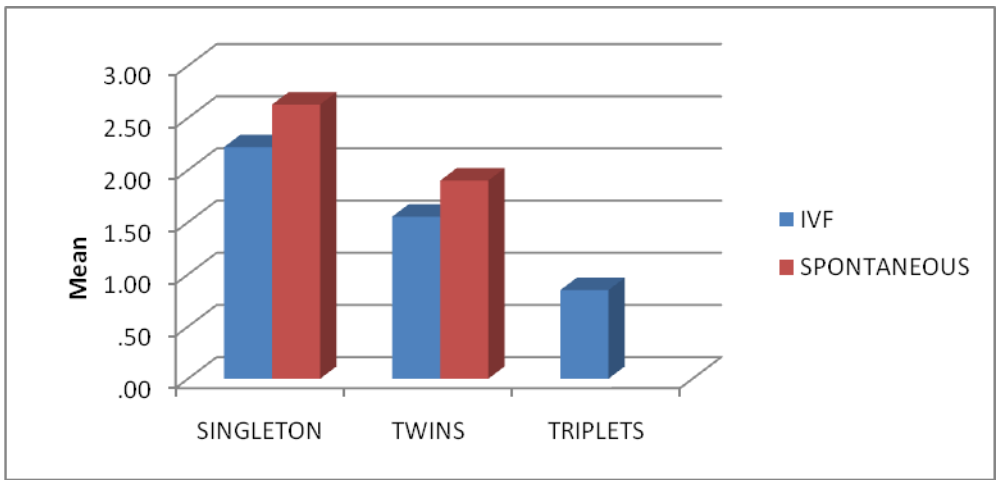

Figure 30: Comparison of mean neonatal birth weight in singleton, twins and triplets.

Mean birth weight of singleton neonates was 2.22 kg vs 2.63kg in IVF and spontaneously conceived patients and it was statistically significant. (p value< 0.05).

The mean birth weight of twins was 1.55 kg vs 1.9kg in IVF and spontaneously conceived patients and it was statistically insignificant.(p value >0.05).

Since there were no triplets in spontaneous group, birth weight of triplets in IVF and spontaneous group couldn't be compared.

Table 31: Mean NICU stay (days)

	IVF		SPONTANEOUS		Z	p-value
	Mean	SD	Mean	SD		
NICU STAY (DAYS)	13.76	13.50	9.05	8.97	1.48	0.143

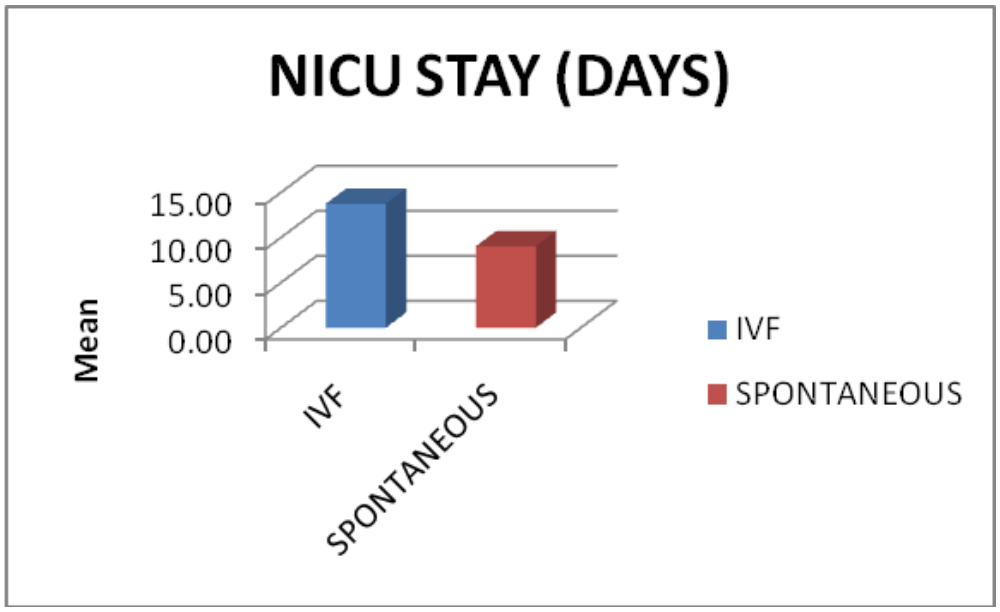

Figure 31: Mean NICU stay(days)

Mean NICU stay was 13.76 days vs 9.05 days in IVF and spontaneously conceived patients.

This relationship was statistically significant. (p value <0.05)

DISCUSSION

The study consisted of 100 women who had delivered at DMCH between September 2022- September 2023. Study group comprised of 50 IVF conceived patients and control group had 50 spontaneously conceived women.They were analysed for maternal and perinatal outcomes in IVF pregnancies compared to spontaneously conceived pregnancies.

In this study, a majority of the patients were more than 35 years of age and the mean age of IVF group patients was 36.4 years. Due to increasing globalization, delayed marriage in late thirties and their decision to delay childbearing is becoming more common. (56) In contrast Yadav R et al. (54)in their study, found that majority of the IVF patients were aged <35 years, with a mean age of 33.16±5.58 years. The average age of spontaneously conceived females being 26.16±4.28 years. This finding may be because people are more familiar with IVF facilities these days.(57)

Majority of the IVF group women in our study were well educated, employed and belonged to higher socioeconomic class (p value<0.05). IVF is an expensive procedure.[58] Income and educational characteristics leads to increased access to these facilities through increased knowledge regarding health care options (59)

The distribution of women based on residential address in rural/urban area in IVF and spontaneous group was not statistically significant. (p value>0.05) This may be attributed to the fact that there is increased awareness about ART services among people residing in rural areas as well. (60)

In our study, mean Body Mass Index was 27.49 vs 25.13 in IVF and spontaneously conceived patients. Gonadotropin secretion is affected in obese patients due to increased peripheral aromatization of androgens to estrogens. Hyperinsulinemia and insulin resistance in obese women lead to hyperandrogenemia. Sex hormone-binding

globulin (SHBG), insulin-like growth factor binding proteins (IGFBP) and growth hormone (GH) levels in plasma are decreased and the levels of leptin increases. So the hypothalamic pituitary ovarian axis regulation is impaired. These changes explain the ovulatory dysfunction and impaired reproductive health in obese women.[61] M.Lang et al. in their study found similar mean BMI 22.50 ± 2.58 vs 22.12 ± 2.65 in IVF and spontaneous group.[55] This may be attributed to the local and geographical differences.

In our study, a majority of population had no history of substance abuse in IVF and spontaneous group.(p value>0.05) This may be attributed to the preconception counselling of the patients regarding smoking and alcohol cessation and other healthier lifestyles.[62]

In this study, mean years of marriage was 7.60 years vs 3.8 years in IVF and spontaneously conceived patients. In women presenting with infertility with anovulation, ovulation induction along with timed intercourse is the appropriate treatment of choice initially. In vitro fertilization is considered when these approaches fail to result in pregnancy. [63] This explains the longer duration of marriage in IVF group. Similarly, Yadav R et al. quoted that the mean years of marriage was 11.2 and 4.7 years in the IVF and spontaneous group couples respectively. [54]

A majority of the patients 80% vs 74% in IVF and spontaneous group were booked at DMCH. Our majority of the patients were well educated and had awareness of getting good antenatal care in this tertiary hospital.

In this study, the IVF and spontaneous groups were mached by parity. A majority (44%) of the IVF group patients were primigravidas and 68% patients had zero parity. This was similar to a study conducted by karavani et al. in which spontaneous group matched for age and parity was constructed. In their study 92.5% of the IVF patients had zero parity and 77.5% were primigravida.[53]

In our study, the most common indication for IVF was endometriosis (28%) followed by tubal factors (22%) and male factor (20%). Endometriosis affects 25% to 40% of women with infertility.[64] Intrauterine insemination (IUI) along with ovarian stimulation after surgical treatment often increases the chances of pregnancy in mild- to moderate endometriosis. But in severe endometriosis patients, preferred treatment options include surgical treatment and assisted reproduction techniques (ART) such as in vitro fertilization. [65]

However,in contrast karavani et al. found that male factor infertility was the most common indication for IVF in their study (63.8%).[53] Treatable causes of male infertility are found in only 18%. (obstructive azoospermia, ejaculatory duct cysts, deficiency of gonadotropins, varicocele, sexual dysfunction , autoimmune male infertility). Remaining 70% of the cases have uncorrectable male infertility they generally have to choose for assisted reproductive technique services (oligozoospermia, teratozoospermia, asthenozoospermia and normospermia with functional defects). [66] Other indications for IVF in this study were pre implantation genetic testing (12.5%), combined female and male etiology (8.8%). [53]

In our study, most of the patients had used self egg (90%) and self sperm (86%). Donor egg (10%) was used in cases of poor oocyte quality or poor ovarian reserve due to advanced age or any history of ovarian surgery. The donor sperms (14%) were used in cases of nonobstructive azoospermia and genetic disorders in husband. [67]

A majority of women (78%) had double embryo transfer, remaining 28% women had single embryo transfer. The transfer of number of embryos after in vitro fertilization (IVF) have been a topic of debate. Despite the policies and clinical recommendations of single embryo transfer, patients often request for multiple embryos transfer in clinical practice. Medical discussions in favor of single embryo transfer are often contrasted with the justifications supporting choice of the patient. Shared decision between the treating physician and a well-informed

and empowered infertile couple has been concluded as an appropriate approach in the literature for deciding the transfer of number of embryos in IVF. [68]

In our study, the most common medical comorbidity was hypothyroidism (28%) in IVF group. Hypothyroidism and autoimmunity diseases of thyroid have a negative impact on reproductive health of women. Hypothyroidism and the resulting hyperprolactinaemia leads to impaired pulsatile secretion of GnRH and thus anovulation, leading to infertility.[69]

Yadav R et al. quoted that the most common risk factor among IVF women was chronic hypertension (18.5%) in their study. [54] This may be attributed to the associated obesity and insulin resistance, over activity of the sympathetic nerves or the chronic use of oral contraceptive pills. Some studies have also shown that chronic hypertension also affects the quality of egg. [70]

Majority of the patients (74% vs 88%) in IVF and spontaneous group had no surgical history. R Yadav et al, quoted that 10% of the IVF group patients had history of abdominal/pelvic surgery, similar to our study.[54]

In our study, the incidence of multiple pregnancy in IVF conceived women was higher than spontaneous group and this was statistically significant. (p value<0.05).This may be attributed to the double embryo transfer in majority of women (72%). R Yadav et al, in their study observed that the number of multiple pregnancy was significantly higher (58.5% vs 2.14%) in IVF than spontaneous group. (p value <0.0001). The multiple embryos transfer in order to increase the IVF cycle hit rate and the plea of the infertile couple who want conception at any cost lead to a considerable difference in the number of multifetal pregnancy.[54]

The most common antepartum complication was pre eclampsia (36% vs 12 %) in IVF and spontaneous group. The incidence of pre

eclampsia was significantly higher in IVF group. (p value <0.05). In IVF pregnancies, the endometrial environment is affected by altered hormone levels, which can disrupt the development of the maternal-fetal interface and causes placental dysfunction. Furthermore, in IVF pregnancies, chorion formation begins in vitro and the intrinsic difference in placental nature may predispose the women to placental vascular damage and placental insufficiency leading to an IVF mediated hypertensive phenotype. Other demographic features such as maternal age and parity also influence the risk of pre eclampsia. The increase in the number of multiple pregnancies following invitro fertilization also explains the increased risk of pre eclamsia in this group. [71] Yadav R et al reported similar observations of pre eclampsia being significantly higher in IVF as compared to spontaneous group and it was statistically significant. [54] M Lang et al, quoted that although the incidence of preeclampsia was slightly higher in the ART group than in the spontaneous pregnancy group (4.1% vs 2.3%), it did not show a statistical difference, which may be related to less sample size. [55]

The risk of pre gestational diabeties mellitus was significantly more in IVF group. (p value <0.05). This may be because many females having ART conceptions have significant risk factors for gestational diabeties mellitus such as advanced maternal age, obesity, multiple pregnancy and polycystic ovary syndrome (PCOS), suggesting a positive association between GDM and invitro fertilization. Pregnancy-induced insulin resistance get superimposed on the insulin resistance associated with pathophysiology of PCOS. Another explanation may be attributed to the high dose of gestational hormones given in IVF techniques, which may precipitate metabolic derangements, glucose intolerance and insulin resistance. [72] Similarly, N Singh in their study quoted that the incidence of GDM was statistically significantly higher 13.9% vs 7% in the IVF group compared to the spontaneous pregnancy group (p<0.001).[26] M Lang et al, in their study quoted that the incidence of GDM in IVF vs spontaneously conceived pregnancy

group was not statistically significant. [55] This study was done at higher level (provincial) hospital and the women delivered there were mostly complex obstetric cases, so the overall rate of complications was above the average. This had lead to underestimation of the obstetric risk associated with ART techniques.

In our study, the risk of preterm labour, pre term premature rupture of membranes, Intrahepatic cholestasis of pregnancy, placenta previa , subclinical hypothyroid , oligohydramnios , APH ,eclampsia and polyhydramnios did not differ between the two groups. (p value >0.05).It can be due to the improved health insurance and access to healthcare services which leads to increased compliance with antenatal care and hence better outcomes.

A Göçmen et al., quoted that the incidence of PPROM was significantly higher in IVF group. (p value <0.05). [73] This may be because that the risk of preterm labor and PPROM is higher with multifetal gestation due to excessive uterine distension.[74]) R Yadav et al., concluded that the incidence of intrahepatic cholestasis of pregnancy was significantly higher in IVF group. (p value <0.0001). Some studies have shown that multiple pregnancies and hormonal treatment in IVF leads to higher levels of serum bile acids. [75]

L Zhu et al.,reported that singleton nulliparous women who underwent ART were more likely to have complications such as placenta previa and placenta abruption. [13] This may be because ART involves frequent manipulation of gametes, which disturbs the epigenetic reprogramming of the embryo,and hence affects both embryonic and extraembryonic tissues. Consequently, there occurs edema and microcalcifications in the placenta.These pathological changes lead to placenta mediated complications like antepartum hemorrhage (APH), abruption placenta and placenta previa among the IVF group. [26]

In our study, the incidence of intrapartum complications like primary post partum hemorrhage (2% vs 0%) and placenta accreta (0% vs 2%)

in IVF as compared to spontaneous group was not statistically significant. This may be because our study was conducted at a tertiary hospital which is well equipped and has clinical expertise for all types of high risk cases. Similarly Karavani et al. Found that the risk of post partum hemorrhage in IVF and spontaneous group was not statistically significant. (8.8% vs 6.1% p value 0.603). [53]

However, D Tang et al concluded that the risk of post partum hemorrhage (3.4% vs 1.7%, $p < 0.01$). and placenta accreta/increta (0.79% vs. 0.30%, $p < 0.01$) in IVF and spontaneous group was statistically significant. As discussed earlier, the risk of placental abnormalities are more in cases of IVF and these placental abnormalities such as placenta previa and placenta accreta or increta are common risk factors for post partum hemorrhage. Additionally, maternal infertility factors such as endometriosis, adenomyosis and hysteromyoma are also known risk factors of PPH. Therefore, the infertility factors in women also contribute to the increased risk of PPH. So the risk of PPH is higher in IVF conceived group that is mostly due to the placental abnormalities and infertility related maternal factors. [76]

In our study the risk of post partum complications like chronic hypertension (12% vs 2%), post partum diabeties mellitus (10% vs 4%), puerperal sepsis(6% vs 2%) and retained placenta (2% vs 0%) did not differ between IVF and spontaneous group. (p value >0.05) So the post partum complications do not depend upon the mode of conception.

IVF group had demonstrated higher rate of early or late preterm deliveries than spontaneous group and it was statistically significant. (p value <0.05). This may be because studies have demonstrated that higher maternal age, multifetal pregnancy, pre eclampsia,placenta previa and placental abruption increases the risk of preterm birth in women undergoing IVF. It has been reported that the unique endocrinological environment with high estradiol concentrations in invitrofertilization may be responsible. [77] Similarly P. Cavoretto et al in

their study showed a significant increase in the incidence of preterm births in IVF pregnancies compared to spontaneously conceived pregnancies. (78)

However in contrast, karavani et al, reported that the number of early or late preterm deliveries in IVF vs spontaneous pregnancies was not statistically significant. (p value 0.354). A possible explanation for the comparable outcomes in this study may be because the highly selected study population of IVF conceived young women (17-25 years) with singleton pregnancies was included in this study. (53)

In our study, mode of delivery was lower segment cesarian section in majority of IVF conceived patients (78%). The most common indication was cesarian section on maternal request (28.2%). This may be because IVF neonates are generally considered more 'precious' and couples request for a safer delivery option mainly a caesarean section. (26)

This was similar to a study conducted by Iwona Szymusik et al, Sixty-nine percent of the IVF group women had cesarean section as compared to 44% of the spontaneously conceived patients. The indications for cesarian section were different between the two groups significantly. The majority of Cesarian section among the IVF group was elective, almost 50% of them were performed because of the treatment of invitrofertilisation treatment and there was no obstetric indication. (79)

In our study, a total of 53.1% vs 50.9% female babies in IVF and spontaneous group and 48.4 % vs 49.1% male babies in IVF and spontaneous group.This was statistically insignificant (p-value >0.05). Similarly Xueyan Li et al. reported that there was no statistically significant difference in fetal gender between IVF and spontaneous groups. (80) Pre-natal diagnostic techniques (PNDT) act was passed in 1994, then amended and effectively implemented in 2003 and was strictly amended in 2011. This act was passed to stop the heinous

crime of female foeticide that was taking place due to prenatal sex determination.(81) None of the IVF conceived patient in our study had sex determination.

Results of our study did not demonstrate an increased risk for congenital anomalies and intrauterine fetal demise associated with IVF. (p value >0.05) This may be because ART conceived pregnancies were treated as high risk pregnancies and had increased surveillance. Serial ultrasounds and appropriate screening test were done at the antenatal visits. Similarly, M Lang et al, in their study found that the risk of fetal anomalies in IVF vs spontaneous pregnancies was statistically insignificant. [(55)] Karavani et al, in their study found that the risk of antepartum/ intrapartum fetal death associated with IVF was statistically insignificant. [(53)]

In contrast, G Maor et al in their study concluded that ART conceived infants had a higher risk of birth defects than spontaneous group women. ART associated malformations were cyanotic heart defects, cleft lip, cleft palate and hypospadias. [(82).] Women in ART group had higher maternal age than spontaneously conceived group. Diabetes mellitus type I and II, immunological causes, history of antiepileptics medications, etc. were the predisposing factors for congenital malformations. Number of multifetal pregnancies is higher with ART techniques and twins have a higher risk of congenital malformation (monochorionic twins more than dichorionic twins) than a singleton. [(83)]

In our study, there was more number of NICU admissions and higher incidence of respiratory distress syndrome in IVF neonates than spontaneous group. (p value <0.05). Mean NICU stay was 13.76 days vs 9.05 days in IVF and spontaneously conceived patients (p value <0.05) This may be due to the higher number of preterm deliveries in IVF group and hence more incidence of prematurity related complications. Thus, there were more number of NICU admissions in view of respiratory complications such as respiratory distress syndrome (RDS), metabolic complications (hypoglycaemia, hyperbilirubinemia),

necrotizing enterocolitis, feed intolerance and sepsis. Maternal factors influencing the NICU admissions were history of premature rupture of membranes, antepartum haemorrhage and medical disorders such as pre eclampsia during pregnancy. Additionally, neonates born by caesarean section required more intensive treatment such as surfactant administration, oxygen support and longer courses of antibiotics than vaginal delivery neonates. [84] Similarly Banica et al., in their study found that IVF neonates were more frequently admitted in NICU and had higher incidence of respiratory distress syndrome compared to spontaneously conceived group ($p < 0.0001$). [18]

In our study,fetal growth restriction (FGR) was seen in 24.6% vs 9.1% fetus in IVF and spontaneous pregnancies. These results were statistically significant (p value<0.05). A significant antenatal complication observed in IVF group in our study was preeclampsia. In patients of pre eclampsia, inappropriate remodeling of uterine spiral arteries and increased production of antiangiogenic factors, such as soluble fms-like tyrosine kinase 1 (sFlt-1) and soluble endoglin (sEng) leads to uteroplacental insufficiency and causes fetal growth restriction (FGR). [85] Other medical conditions such as gestational diabeties mellitus also contribute to FGR irrespective of glycemic control. [86] Incidence of FGR is more in higher maternal age women (>35 years) and twin pregnancies. [87]

APGAR score at 1 minutes was less than 7 in 23.1% vs 10.9% in IVF and spontaneous group. At 5 minutes, it was less than 7 in 12.3 % vs 5.5% in IVF and spontaneous group. It was statistically insignificant. (p value >0.05). This may be due to the availability of all the necessary equipments, paediatrician and the entire neonatal resuscitation team in the delivery room prior to neonatal birth. [88] Similarly T Egbe et al, reported that the difference in 5 min Apgar score between IVF and spontaneous group was statistically insignificant. (p value 0.59) [89] However, L Zhu et al., quoted that the babies having 1minute Apgar ≤ 7 and 5minute Apgar ≤ 7 were significantly higher for ART group than

spontaneously conceived births. (p value <0.001) [13] This may be due to more number of preterm births and low birth weight neonates in IVF group.

In our study, IVF conceived patients had low neonatal birth weight compared to spontaneously conceived patients and it was statistically significant. (p value <0.05). Mean birth weight was 1.88kg vs 2.50 kg in IVF and spontaneously conceived patients. (p value <0.05). Among singletons, mean birth weight was 2.22 kg vs 2.63kg in IVF and spontaneously conceived groups (p value< 0.05). The mean birth weight of twins was 1.55 kg vs 1.9kg in IVF and spontaneously conceived patients.(p value >0.05). The increased risk of low birth weight associated with the use of assisted reproductive technology has been attributed largely to the more incidence of multiple gestations associated with this technology. The risk factors such as pre eclampsia and fetal growth restriction also causes low birth weight. Studies have shown that culture media used for embryo development also influences the birth weight. [90] Recently, C Spits et al, quoted that a greater risk of low birth weight was found to have association with certain mutations in mitochondrial DNA, and reported that these mutations were slightly more common in children born after fertility treatment. [91] Similarly Banika et al, found that IVF conceived patients had low birth weight babies compared to spontaneously conceived patients(p value <0.0001). [18]

SUMMARY AND CONCLUSION

The study consisted of 100 women who had delivered at DMCH between September 2022- September 2023. Study group comprised of 50 IVF conceived patients and control group had 50 spontaneously conceived women.They were analysed for maternal and perinatal outcomes in IVF pregnancies compared to spontaneously conceived pregnancies after matching with age and parity.

- Mean age of IVF group vs spontaneous group in our study was 36.4 years vs 33.38 years. IVF and spontaneous groups were matched by age(+_2 years) and p value was statistically insignificant.
- Most of the IVF group women in our study were well educated, employed and belonged to higher socioeconomic class (p value<0.05).
- Mean Body Mass Index was 27.49 vs. 25.13 in IVF and spontaneously conceived patients and it was statistically significant.
- Mean years of marriage was 7.60 years vs 3.8 years in IVF and spontaneously conceived patient. Results were statistically significant.
- The IVF and spontaneous groups were mached by parity. A majority (44%) of the IVF group patients were primigravidas and 68% patients had zero parity.
- In our study, the most common indication for IVF was endometriosis (28%) followed by tubal factors (22%) and male factor (20%).

- Most of the patients had used self egg (90%) and self sperm (86%) and a majority of women(78%) had double embryo transfer, remaining 28% women had single embryo transfer.

- The most common medical comorbidity was hypothyroidism (28%) in IVF and spontaneously conceived group.

- The number of multiple pregnancies in IVF group was higher than spontaneous group and this was statistically significant. (p value<0.05).

- The most common antepartum complication was pre eclampsia (36% vs 12 %) in IVF and spontaneous group. The incidence of pre eclampsia and gestational diabeties mellitus was significantly higher in IVF group. (p value <0.05).

- The risk of intrapartum and postpartum complications in IVF and spontaneous group was not statistically significant.

- IVF group had demonstrated higher number of preterm deliveries than spontaneous group and it was statistically significant. (p value <0.05).

- Mode of delivery was lower segment cesarian section in majority of IVF conceived patients (78%). The most common indication was cesarian section on maternal request (28.2%).

- Results of our study did not demonstrate an increased risk for congenital anomalies and intrauterine fetal demise associated with IVF. (p value >0.05)

- There was more number of NICU admissions and higher incidence of respiratory distress syndrome in IVF neonates than spontaneous group. (p value <0.05). Mean NICU stay was 13.76 days vs 9.05 days in IVF and spontaneously conceived patients (p value <0.05)

- Fetal growth restriction (FGR) was seen in 24.6% vs 9.1% fetus in IVF and spontaneous pregnancies. This was statistically significant (p value<0.05).

- 1 minute APGAR score was less than 7 in 23.1% vs 10.9% in IVF and spontaneous group . At 5 minutes, it was less than 7 in 12.3 % vs 5.5% in IVF and spontaneous group. It was statistically insignificant. (p value >0.05).

- IVF conceived patients had low neonatal birth weight compared to spontaneously conceived patients and it was statistically significant. (p value <0.05). Mean birth weight was 1.88kg vs 2.50 kg in IVF and spontaneously conceived patients. (p value <0.05).

- The limitation of this study was a small sample size and study being confined to a single tertiary centre. There was a lack of a subgroup analysis within the IVF study group regarding the type of embryo transfer, ovarian stimulation protocoal, culture media used. In addition only the pregnancies with gestation more than 20 weeks were selected for this study. We lacked an assessment of the risk of abortions, ectopic pregnancies associated with IVF.

BIBLIOGRAPHY

1. Carson SA, Kallen AN. Diagnosis and Management of Infertility: A Review. JAMA. 2021;326(1):65-76.
2. Deshpande PS, Gupta AS. Causes and Prevalence of Factors Causing Infertility in a Public Health Facility. J Hum Reprod Sci. 2019;12(4):287-293.
3. Yang X, Li Y, Li C, Zhang W. Current overview of pregnancy complications and live-birth outcome of assisted reproductive technology in mainland China. Fertil Steril. 2014;101(2):385-91.
4. Katole A, Saoji AV. Prevalence of Primary Infertility and its Associated Risk Factors in Urban Population of Central India: A Community-Based Cross-Sectional Study. Indian J Community Med. 2019;44(4):337-341.
5. Jain M, Singh M. Assisted Reproductive Technology (ART) Techniques. [Updated 2023 Jun 7]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan
6. Infertility Workup for the Women's Health Specialist: ACOG Committee Opinion Summary, Number 781. Obstet Gynecol. 2019;133:1294-5.
7. Abdollahi M, Omani Samani R, Hemat M, Arabipoor A, Shabani F, Eskandari F, et al. Factors that Influence The Occurrence of Multiple Pregnancies after Intracytoplasmic Injection Cycles with Two or Three Fresh Embryo Transfers. Int J Fertil Steril. 2017;11(3):191-6.
8. Amini P, Ramezanali F, Parchehbaf-Kashani M, Maroufizadeh S, Omani-Samani R, Ghaheri A. Factors Associated with In Vitro Fertilization Live Birth Outcome: A Comparison of Different Classification Methods. Int J Fertil Steril. 2021;15(2):128-34.
9. Walker MH, Tobler KJ. Female Infertility. [Updated 2022 Dec 19]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK556033/

10. Vander Borght M, Wyns C. Fertility and infertility: Definition and epidemiology. Clinical biochemistry. 2018;62:2-10.
11. Choe J, Shanks AL. In Vitro Fertilization. [Updated 2023 Sep 4]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK562266/
12. Kushnir VA, Smith GD, Adashi EY. The Future of IVF: The New Normal in Human Reproduction. Reprod Sci. 2022;29(3):849-56.
13. Zhu, L., Zhang, Y., Liu, Y. Maternal and Live-birth Outcomes of Pregnancies following Assisted Reproductive Technology: A Retrospective Cohort Study. Sci Rep. 2016;6:35141.
14. Tocariu R, Stan D, Mitroi RF, Căldăraru DE, Dinulescu A, Dobre CE, et al. Incidence of complications among in vitro fertilization pregnancies. J Med Life. 2023;16(3):399-405.
15. Silvestris E, Petracca EA, Mongelli M, Arezzo F, Loizzi V, Gaetani M, et al. Pregnancy by Oocyte Donation: Reviewing Fetal-Maternal Risks and Complications. Int J Mol Sci. 2023;24(18):13945.
16. Su RN, Zhu WW, Wei YM, Wang C, Feng H, Lin L, et al. Maternal and neonatal outcomes in multiple pregnancy: A multicentre study in the Beijing population. Chronic Dis Transl Med. 2015;1(4):197-202.
17. Wei J, Wu QJ, Zhang TN, Shen ZQ, Liu H, Zheng DM, Cui H; Collaborative Group on Twin Birth and Fetal Abnormality in China; Liu CX. Complications in multiple gestation pregnancy: A cross-sectional study of ten maternal-fetal medicine centers in China. Oncotarget. 2016;7(21):30797-803.
18. Bănică AM, Popescu SD, Vlădăreanu S. Maternal and neonatal outcomes following in vitro fertilization: A cohort study in Romania. Exp Ther Med. 2022;23(1):34.
19. Fineman DC, Keller RL, Maltepe E, Rinaudo PF, Steurer MA. Fertility treatment increases the risk of preterm birth independent of multiple gestations. F S Rep. 2023;4(3):313-20.

20. Kathpalia SK, Kapoor K, Sharma A. Complications in pregnancies after in vitro fertilization and embryo transfer. Med J Armed Forces India. 2016;72(3):211-4.
21. Pokulniewicz M, Issat T, Jakimiuk A. In vitro fertilization and age. When old is too old? Prz Menopauzalny. 2015;14(1):71-3.
22. Seshadri JG, Balani V, Kempaiah SB. Fetomaternal Complications of In Vitro Fertilization Pregnancies in a Tertiary Center. Int J Infertil Fetal Med. 2022;13(3):116-20.
23. Simopoulou M, Sfakianoudis K, Rapani A, Giannelou P, Anifandis G, Bolaris S, et al. Considerations Regarding Embryo Culture Conditions: From Media to Epigenetics. In Vivo. 2018;32(3):451-460.
24. Guo X, Yi H, Li TC, Wang Y, Wang H, Chen X. Role of Vascular Endothelial Growth Factor (VEGF) in Human Embryo Implantation: Clinical Implications. Biomolecules. 2021;11(2):253.
25. Sullivan-Pyke CS, Senapati S, Mainigi MA, Barnhart KT. In Vitro fertilization and adverse obstetric and perinatal outcomes. Semin Perinatol. 2017;41(6):345-53.
26. Singh N, Malhotra N, Mahey R, Saini M, Patel G, Sethi A. Comparing maternal outcomes in spontaneous singleton pregnancies versus in vitro fertilization conception: Single-center 10-year cohort study. JBRA Assist Reprod. 2022;26(4):583-8.
27. Tuoti WA. History of the Monash IVF Research Program from 1971 to 1989. Arizona State University. School of Life Sciences. Center for Biology and Society. Embryo Project Encyclopedia.| Arizona Board of Regents; 2020.
28. Kamel RM. Assisted reproductive technology after the birth of louise brown. J Reprod Infertil. 2013;14(3):96-109.
29. Fertility and Sterility® 2018;110:0015-0282/$36.00 Copyright ©2018 American Society for Reproductive Medicine, Published by Elsevier Inc. https://doi.org/10.1016/j.fertnstert.2018.05.034.
30. Kim SW, Lee M, Kim H, Ku SY. The first woman born by in vitro fertilization in Korea gave birth to a healthy baby through natural pregnancy. Obstet Gynecol Sci. 2021;64(4):390-2.

31. Dow K. Looking into the Test Tube: The Birth of IVF on British Television. Med Hist. 2019;63(2):189-208.
32. Sharma RS, Saxena R, Singh R. Infertility & assisted reproduction: A historical & modern scientific perspective. Indian J Med Res. 2018;148:S10-S14.
33. "The doctor behind the first Indian life outside the womb – Financial Express"
34. Mukherjee S, Mehta R. Archiving the work of Dr. Subhas Mukherjee: The architect of India's test tube baby. Indian Journal of History of Science. 2024;59(1):113-21.
35. Infertility of Indian Establishment indiananalysis.blogspot.in. Retrieved 20 August 2013
36. Britannica, The Editors of Encyclopaedia. "Robert Edwards". Encyclopedia Britannica, 30 Apr. 2024, https://www.britannica.com/biography/Robert-Edwards. Accessed 26 June 2024.
37. Johnson MH. Robert Edwards: the path to IVF. Reprod Biomed Online. 2011;23(2):245-62.
38. Tuoti, Whitney Alexandra, "Edwin Carlyle (Carl) Wood (1929–2011)". Embryo Project Encyclopedia (2021-04-01). ISSN: 1940-5030 https://hdl.handle.net/10776/13248
39. JOHASAM: Journal of Health, Applied Sciences and Management. Published by RIVERS STATE COLLEGE OF HELATH SCIENCE & TECHNOLOGY KM 6 IKWERRE ROAD, RUMUEME PORT HARCOURT, NIGERIA. 2018;2:198-204.
40. Beall SA, DeCherney A. History and challenges surrounding ovarian stimulation in the treatment of infertility. Fertil Steril. 2012;97:795–801.
41. Swain JE, Carrell D, Cobo A, Meseguer M, Rubio C, Smith GD. Optimizing the culture environment and embryo manipulation to help maintain embryo developmental potential. Fertil Steril. 2016;105:571–87.
42. Eskew AM, Jungheim ES. A History of Developments to Improve in vitro Fertilization. Mo Med. 2017;114(3):156-9.

43. Gross, Rachel E. "The female scientist who changed human fertility forever". www.bbc.com. Retrieved. 2023-08-15.
44. "The History of IVF -The Milestones". IVF-Worldwide. Retrieved 2021-03-22.
45. Palomba S, Homburg R, Santagni S, La Sala GB, Orvieto R. Risk of adverse pregnancy and perinatal outcomes after high technology infertility treatment: a comprehensive systematic review. Reprod Biol Endocrinol. 2016;14(1):76.
46. Qin J, Wang H, Sheng X, Liang D, Tan H, Xia J. Pregnancy-related complications and adverse pregnancy outcomes in multiple pregnancies resulting from assisted reproductive technology: a meta-analysis of cohort studies. Fertil Steril. 2015;103(6):1492-508.e1-7.
47. Qin J, Liu X, Sheng X, Wang H, Gao S. Assisted reproductive technology and the risk of pregnancy-related complications and adverse pregnancy outcomes in singleton pregnancies: a meta-analysis of cohort studies. Fertil Steril. 2016;105(1):73-85.e1-6.
48. Sharma R, Harlev A, Agarwal A, Esteves SC. Cigarette Smoking and Semen Quality: A New Meta-analysis Examining the Effect of the 2010 World Health Organization Laboratory Methods for the Examination of Human Semen. Eur Urol. 2016;70(4):635-45.
49. Banerjee K, Singla B. Acceptance of Donor Eggs, Donor Sperms, or Donor Embryos in Indian Infertile Couples. J Hum Reprod Sci. 2018;11(2):169-171.
50. Balayla J, Sheehy O, Fraser WD, Séguin JR, Trasler J, Monnier P, et al; 3D-Study Research Group From the Integrated Research Network in Perinatology of Quebec and Eastern Ontario. Neurodevelopmental Outcomes After Assisted Reproductive Technologies. Obstet Gynecol. 2017;129(2):265-272.
51. Khudhari, A., Mourad, A., Phillips, S. Perinatal outcomes of human singletons conceived naturally versus assisted reproductive technologies: analysis of the effect of stimulated IVF, modified natural IVF, and frozen embryo transfer. Middle East Fertil Soc J. 2021;26:7.

52. Ganer Herman H, Mizrachi Y, Shevach Alon A, Farhadian Y, Gluck O, Bar J, et al. Obstetric and perinatal outcomes of in vitro fertilization and natural pregnancies in the same mother. Fertil Steril. 2021 Apr;115(4):940-6.
53. Karavani G, Chill HH, Dick A, Bergman M, Imbar T, Grisaru-Granovsky S, et al. Obstetric outcomes of young women following in-vitro fertilization: a case-control study. BMC Pregnancy Childbirth. 2022;22(1):164.
54. Yadav M, Venkadalakshmi V, Das K, Singla R. Knowledge Regarding Contraception and Previous Practices of Contraception Among Antenatal Women. Nursing & Mid wifery Research Journal. 2024;20(2):112-23.
55. Lang M, Zhou M, Lei R, Li W. Comparison of pregnancy outcomes between IVF-ET pregnancies and spontaneous pregnancies in women of advanced maternal age. J Matern Fetal Neonatal Med. 2023;36(1):2183761.
56. Zabak S, Varma A, Bansod S, Pohane MR. Exploring the Complex Landscape of Delayed Childbearing: Factors, History, and Long-Term Implications. Cureus. 2023;15(9):e46291.
57. Fortin C, Abele S. Increased Length of Awareness of Assisted Reproductive Technologies Fosters Positive Attitudes and Acceptance among Women. Int J Fertil Steril. 2016;9(4):452-64.
58. Singh K, Dewani D. Recent Advancements in In Vitro Fertilisation. Cureus. 2022;14(10):e30116.
59. Smith JF, Eisenberg ML, Glidden D, Millstein SG, Cedars M, Walsh TJ, et al. Socioeconomic disparities in the use and success of fertility treatments: analysis of data from a prospective cohort in the United States. Fertil Steril. 2011;96(1):95-101.
60. Kushnir VA, Smith GD, Adashi EY. The Future of IVF: The New Normal in Human Reproduction. Reprod Sci. 2022;29(3):849-56.
61 Dağ ZÖ, Dilbaz B. Impact of obesity on infertility in women. J Turk Ger Gynecol Assoc. 2015;16(2):111-7.

62 Boedt T, Vanhove AC, Vercoe MA, Matthys C, Dancet E, Lie Fong S. Preconception lifestyle advice for people with infertility. Cochrane Database Syst Rev. 2021;4(4):CD008189.

63. Balen AH, Morley LC, Misso M, Franks S, Legro RS, Wijeyaratne CN, et al. The management of anovulatory infertility in women with polycystic ovary syndrome: an analysis of the evidence to support the development of global WHO guidance. Hum Reprod Update. 2016;22(6):687-708.

64. Ozkan S, Murk W, Arici A. Endometriosis and infertility: epidemiology and evidence-based treatments. Ann N Y Acad Sci. 2008;1127:92–100.

65. Lee D, Kim SK, Lee JR, Jee BC. Management of endometriosis-related infertility: Considerations and treatment options. Clin Exp Reprod Med. 2020;47(1):1-11.

66. Leslie SW, Soon-Sutton TL, Khan MAB. Male Infertility. [Updated 2024 Feb 25]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK562258/

67. Banerjee K, Singla B. Acceptance of Donor Eggs, Donor Sperms, or Donor Embryos in Indian Infertile Couples. J Hum Reprod Sci. 2018;11(2):169-171.

68. Ezugwu E, der Burg SV. Debating Elective Single Embryo Transfer after in vitro Fertilization: A Plea for a Context-Sensitive Approach. Ann Med Health Sci Res. 2015;5(1):1-7.

69. Herman T, Csehely S, Orosz M, Bhattoa HP, Deli T, Torok P, et al. Impact of Endocrine Disorders on IVF Outcomes: Results from a Large, Single-Centre, Prospective Study. Reprod Sci. 2023;30(6):1878-90.

70. Barekat M, Ahmadi S. Hypertensive Disorders in Pregnant Women Receiving Fertility Treatments. Int J Fertil Steril. 2018;12(2):92-8.

71. Gui J, Ling Z, Hou X, Fan Y, Xie K, Shen R. In vitro fertilization is associated with the onset and progression of preeclampsia. Placenta. 2020;89:50-57.

72. Ghanem YM, El Kassar Y, Magdy MM, Amara M, Amin NG. Potential risk of gestational diabetes mellitus in females undergoing in vitro fertilization: a pilot study. Clin Diabetes Endocrinol. 2024;10(1):7.
73. Göçmen A, Güven Ş, Bağci S, Çekmez Y, Şanlıkan F. Comparison of maternal and fetal outcomes of IVF and spontaneously conceived twin pregnancies: three year experience of a tertiary hospital. Int J Clin Exp Med. 2015;8(4):6272-6.
74. Adams Waldorf KM, Singh N, Mohan AR, Young RC, Ngo L, Das A, et al. Uterine overdistention induces preterm labor mediated by inflammation: observations in pregnant women and nonhuman primates. Am J Obstet Gynecol. 2015;213(6):830.e1-830.e19.
75. Bolukbas FF, Bolukbas C, Y Balaban H, Aygun C, Ignak S, Ergul E, et al. Intrahepatic Cholestasis of Pregnancy: Spontaneous vs in vitro Fertilization. Euroasian J Hepatogastroenterol. 2017;7(2):126-9.
76. Tang D, Cheng Y, Feng X, Li X, Coyte PC. The use of IVF/ICSI and risk of postpartum hemorrhage: A retrospective cohort study of 153,765 women in China. Front Public Health. 2023;11:1016457.
77. Li J, Shen J, Zhang X, Peng Y, Zhang Q, Hu L, et al. Risk factors associated with preterm birth after IVF/ICSI. Sci Rep. 2022 May 13;12(1):7944.
78. Cavoretto P, Candiani M, Giorgione V, Inversetti A, Abu-Saba MM, Tiberio F, et al. Risk of spontaneous preterm birth in singleton pregnancies conceived after IVF/ICSI treatment: meta-analysis of cohort studies. Ultrasound Obstet Gynecol. 2018;51(1):43-53.
79. Szymusik I, Kosinska-Kaczynska K, Krowicka M, Sep M, Marianowski P, Wielgos M. Perinatal outcome of in vitro fertilization singletons - 10 years' experience of one center. Arch Med Sci. 2019;15(3):666-672.
80. Li X, Jauniaux E. Antenatal fetal growth patterns in uncomplicated pregnancies according to mode of conception and placental location. Placenta. 2024;145:89-91.

81. Dhar M, Payal YS, Krishna V. The Pre-Conception and Pre-Natal Diagnostic Techniques Act and its implication on advancement of ultrasound in anaesthesiology; time to change mindsets rather than laws. Indian J Anaesth. 2018;62(12):930-3.
82. Shechter-Maor G, Czuzoj-Shulman N, Spence AR. The effect of assisted reproductive technology on the incidence of birth defects among livebirths. Arch Gynecol Obstet. 2018;297:1397–403.
83. Tandulwadkar S, Lodha P, Kharb V. Congenital malformations and assisted reproductive technique: Where is assisted reproductive technique taking us? J Hum Reprod Sci. 2012;5(3):244-7.
84. Quinn CE, Sivasubramaniam P, Blevins M, Al Hajajra A, Znait AT, Khuri-Bulos N, Faouri S, Halasa N. Risk factors for neonatal intensive care unit admission in Amman, Jordan. East Mediterr Health J. 2016;22(3):163-74.
85. Takahashi M, Makino S, Oguma K, Imai H, Takamizu A, Koizumi A, et al. Fetal growth restriction as the initial finding of preeclampsia is a clinical predictor of maternal and neonatal prognoses: a single-center retrospective study. BMC Pregnancy Childbirth. 2021;21(1):678.
86. Fasoulakis Z, Koutras A, Antsaklis P, Theodora M, Valsamaki A, Daskalakis G, et al. Intrauterine Growth Restriction Due to Gestational Diabetes: From Pathophysiology to Diagnosis and Management. Medicina (Kaunas). 2023;59(6):1139.
87. Glick I, Kadish E, Rottenstreich M. Management of Pregnancy in Women of Advanced Maternal Age: Improving Outcomes for Mother and Baby. Int J Womens Health. 2021;13:751-9.
88. Simon LV, Shah M, Bragg BN. APGAR Score. [Updated 2024 Mar 19]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK470569/
89. Egbe TO, Sandjon G, Ourtchingh C, Simo A, Priso EB, Benifla JL. In-vitro fertilization and spontaneous pregnancies: matching outcomes in Douala, Cameroon. Fertil Res Pract. 2016;2:1.

90. Bouillon C, Léandri R, Desch L, Ernst A, Bruno C, Cerf C, et al. Does Embryo Culture Medium Influence the Health and Development of Children Born after In Vitro Fertilization? PLoS One. 2016;11(3):e0150857.
91. Mertens J, Belva F, van Montfoort AP, Regin M, Zambelli F, Seneca Set al. Children born after assisted reproduction more commonly carry a mitochondrial genotype associating with low birthweight. Nature Communications. 2024;15(1):1232.

Sr. No.	MRD NO	NAME	AGE (YEARS)	AGE GROUP	EDUCATION	SOCIO-ECONOMIC STATUS	OCCUPATION	RESIDENTIAL ADDRESS	MARRIED FOR (YEARS)	MARRIED FOR (YEARS) GP	BOOKED	OBSTETRIC HISTORY	MODE OF CONCEPTION	GP	INDICATION FOR IVF	OVUM	SPERM
1	1463361	M	39	3	PG	U	E	U	14	2	OUTSIDE	G1	IVF	1	O	D	S
2	1519097	R	40	3	PG	UL	E	U	14	2	DMCH	G1	IVF	1	E	S	S
3	7541	B	40	3	PG	UL	E	U	10	2	DMCH	G2P1L1	IVF	1	M	S	D
4	730479	S	33	2	G	UM	H	U	5	2	OUTSIDE	G1	IVF	1	E	S	S
5	1491650	PJ	45	3	G	LM	H	R	15	2	OUTSIDE	G4P1L1A2	IVF	1	U	S	S
6	1494547	RK	36	3	G	UM	E	U	5	2	OUTSIDE	G2A1	IVF	1	T	S	S
7	202108	GD	36	3	UG	UM	H	U	12	2	DMCH	G3P2L2	IVF	1	U	S	S
8	1663183	AD	41	3	G	UM	E	U	7	2	DMCH	G1	IVF	1	E	S	S
9	1657514	A	37	3	G	LM	E	R	5	2	DMCH	G1	IVF	1	O	S	S
10	979258	D	35	3	G	U	E	U	8	2	DMCH	G2A1	IVF	1	E	S	S
11	1645998	E	34	2	UG	UM	E	U	8	2	DMCH	G2P1L1	IVF	1	M	S	S
12	1648930	J	35	3	PG	UM	E	U	7	2	DMCH	G1	IVF	1	T	S	S
13	1647674	V	33	2	UG	UM	E	R	8	2	DMCH	G3A2	IVF	1	M	S	S
14	1652050	M	33	2	G	LM	E	U	8	2	DMCH	G2A1	IVF	1	T	S	S
15	1626357	A	35	3	G	UM	H	R	11	2	DMCH	G2A1	IVF	1	E	S	S
16	1625360	SJ	30	1	G	U	E	U	6	2	DMCH	G1	IVF	1	M	S	D
17	1619034	P	44	3	UG	UM	E	R	7	2	DMCH	G1	IVF	1	M	S	D
18	1617179	V	34	2	PG	UM	H	U	8	2	DMCH	G2P1L1	IVF	1	U	S	S
19	1638852	S	36	3	G	UM	H	U	8	2	OUTSIDE	G2P1L0	IVF	1	M	S	D
20	90247	I	32	2	G	U	H	R	5	2	DMCH	G2A1	IVF	1	E	S	S
21	90040	S	30	1	PG	LM	E	U	4	1	DMCH	G1	IVF	1	M	S	D
22	1656613	A	32	2	G	UM	E	U	6	2	OUTSIDE	G1	IVF	1	T	S	S
23	1590062	R	34	2	G	LM	E	R	5	2	DMCH	G1	IVF	1	M	S	D
24	1240981	P	28	1	G	UM	E	U	4	1	DMCH	G1	IVF	1	O	S	S
25	1599928	M	37	3	UG	UM	H	R	10	2	DMCH	G3P2L1	IVF	1	U	D	S
26	1610773	R	30	1	PG	U	E	U	8	2	DMCH	G2P1L1	IVF	1	O	D	S
27	1600268	R	34	2	PG	UM	E	U	7	2	DMCH	G2A1	IVF	1	E	S	S
28	1610826	K	30	1	G	LM	H	U	8	2	DMCH	G1	IVF	1	E	S	S
29	1591392	J	36	3	G	UM	E	U	5	2	DMCH	G1	IVF	1	T	S	S
30	1629704	SK	34	2	G	UM	E	R	5	2	DMCH	G1	IVF	1	O	S	S
31	1657514	A	37	3	UG	UM	H	R	8	2	DMCH	G1	IVF	1	E	S	S
32	1490941	SN	37	3	PG	U	E	U	7	2	DMCH	G1	IVF	1	O	D	S
33	1468383	RD	45	3	G	UM	E	U	13	2	DMCH	G2P1L1	IVF	1	U	S	S
34	1358150	MK	32	2	G	UM	H	R	9	2	DMCH	G1	IVF	1	E	S	S
35	1605533	R	32	2	G	U	E	R	8	2	DMCH	G2P1L1	IVF	1	T	S	S

Sr. No.	MRD NO	EMBRYOS TRANSFERRED	MEDICAL HISTORY	SURGICAL HISTORY	SUBSTANCE ABUSE WIFE	SUBSTANCE ABUSE HUSBAND	BMI (Kg/m2)	BMI GROUP	NO. OF FETUS	S/C HYPOTHYROID	GDM	GESTATIONAL HTN/ P.E	PPROM	FGR	OLIGO	PLACENTA PREVIA	APH
1	1463361	2	NO	NO	NO	N	29	3	TWINS	Y	N	N	Y	Y	N	N	N
2	1519097	2	CHRONIC HYPERTENSION	NO	NO	N	31.5	4	TWINS	N	Y	N	N	N	N	N	N
3	7541	2	NO	NO	NO	Y	28	3	SINGLETON	Y	N	Y	N	Y	N	Y	N
4	730479	2	HYPOTHYROIDISM	LAP CYSTECTOMY	NO	N	27	3	TWINS	N	N	Y	N	N	N	N	N
5	1491650	2	HYPOTHYROIDISM	LAP SALPINGECTOMY	Y	N	31	4	SINGLETON	N	N	Y	N	N	N	Y	N
6	1494547	2	NO	NO	NO	N	32.5	4	TWINS	N	N	Y	Y	N	N	N	N
7	202108	1	HYPOTHYROIDISM	NO	Y	N	28	3	SINGLETON	N	N	N	Y	N	N	N	N
8	1663183	2	OTHERS	LAP CYSTECTOMY	NO	N	27.5	3	SINGLETON	Y	N	Y	N	Y	Y	N	N
9	1657514	2	NO	LAP APPENDICECTOMY	NO	N	25	3	SINGLETON	N	Y	N	Y	N	N	N	N
10	979258	2	DM, HYPOTHYROIDISM	NO	NO	N	32	4	SINGLETON	N	N	N	N	Y	N	N	N
11	1645998	2	NO	NO	NO	Y	24	2	SINGLETON	N	Y	Y	N	N	N	Y	N
12	1648930	1	CHRONIC HYPERTENSION	NO	NO	N	27.5	3	SINGLETON	N	N	N	N	N	N	N	N
13	1647674	1	HYPOTHYROIDISM	NO	NO	N	25.5	3	SINGLETON	N	N	N	N	Y	N	N	Y
14	1652050	1	NO	NO	NO	N	33	4	SINGLETON	N	N	Y	N	N	N	N	N
15	1626357	2	HYPOTHYROIDISM	LAP CYSTECTOMY	NO	N	28	3	TWINS	N	N	N	Y	Y	N	N	N
16	1625360	2	NO	NO	NO	N	27	3	TWINS	N	N	Y	N	N	N	N	N
17	1619034	2	DM, HYPOTHYROIDISM	NO	NO	Y	26.5	3	SINGLETON	N	N	N	Y	Y	N	N	N
18	1617179	1	NO	NO	NO	N	28	3	SINGLETON	N	Y	N	N	N	N	Y	N
19	1638852	2	OTHERS	NO	NO	N	27	3	TWINS	N	Y	N	N	N	N	N	N
20	90247	2	HYPOTHYROIDISM	NO	NO	N	25	3	SINGLETON	N	N	N	N	N	N	N	N
21	90040	1	NO	LAP APPENDICECTOMY	Y	Y	24	2	SINGLETON	N	N	Y	N	Y	Y	N	N
22	1656613	2	NO	NO	NO	N	24	2	SINGLETON	N	N	N	Y	N	N	N	N
23	1590062	2	HYPOTHYROIDISM	NO	NO	Y	26.5	3	SINGLETON	N	N	N	N	N	N	N	N
24	1240981	1	NO	NO	NO	Y	28	3	SINGLETON	N	N	Y	Y	N	N	N	N
25	1599928	2	HYPOTHYROIDISM	NO	NO	N	27	3	SINGLETON	N	N	Y	N	N	N	Y	N
26	1610773	2	NO	OTHERS	NO	N	29.5	3	SINGLETON	N	N	N	N	N	N	N	N
27	1600268	1	HYPOTHYROIDISM	NO	NO	N	30	4	SINGLETON	N	Y	N	N	N	N	N	N
28	1610826	2	NO	LAP CYSTECTOMY	Y	N	28	3	TRIPLETS	N	N	N	Y	Y	N	N	N
29	1591392	2	NO	NO	NO	N	29	3	TWINS	N	Y	Y	N	N	N	N	N
30	1629704	1	HYPOTHYROIDISM	NO	NO	N	27	3	SINGLETON	N	N	Y	N	N	N	N	N
31	1657514	2	OTHERS	OTHERS	NO	N	28.5	3	SINGLETON	N	Y	N	N	Y	Y	N	N
32	1490941	2	NO	NO	NO	N	27	3	SINGLETON	N	N	N	N	N	N	N	N
33	1468383	2	DM	ABDOMINAL MYOMECTOMY	NO	Y	24	2	TWINS	Y	N	N	N	Y	Y	N	Y
34	1358150	1	NO	NO	NO	N	28	3	SINGLETON	N	Y	Y	N	Y	Y	N	N
35	1605533	2	NO	NO	NO	N	23	2	SINGLETON	Y	Y	N	N	N	N	Y	N

Sr. No.	MRD NO	PRETERM LABOUR	FETAL ANOMALIES	POST PARTUM CHRONIC HTN	POST PARTUM DM	PUERPERAL SEPSIS	ECLAMPSIA	ICP	IUFD	POLYHYDRAMNIOS	INTRAPARTUM	RETAINED PLACENTA/OTHER POSTPARTUM	POG AT DELIVERY	PRETERM	MODE OF DELIVERY
1	1463361	N	N	N	N	N	N	Y	N	N	NO	NO	34.3	2	LSCS
2	1519097	N	N	N	Y	N	N	N	N	N	NO	NO	35.2	2	LSCS
3	7541	N	N	N	N	Y	Y	N	N	N	NO	NO	36	2	LSCS
4	730479	N	N	Y	N	N	N	N	N	N	OTHER	NO	34.2	2	LSCS
5	1491650	N	N	N	N	N	N	Y	N	N	NO	NO	32.2	1	LSCS
6	1494547	N	N	N	N	N	N	N	N	N	NO	NO	30.6	1	LSCS
7	202108	N	N	N	N	N	N	N	N	N	NO	NO	38.1	3	LSCS
8	1663183	Y	N	N	N	N	N	N	N	N	NO	YES	27.3	1	VAGINAL DELIVERY
9	1657514	Y	N	N	Y	N	N	N	N	N	NO	NO	35	2	LSCS
10	979258	N	N	N	N	N	N	Y	N	N	NO	NO	36	2	LSCS
11	1645998	Y	N	N	N	N	N	N	N	N	NO	NO	35	2	LSCS
12	1648930	N	N	N	N	N	N	N	N	N	NO	NO	39	3	VAGINAL DELIVERY
13	1647674	Y	N	N	N	N	N	N	N	N	NO	NO	34.1	2	LSCS
14	1652050	N	N	N	N	N	N	N	N	N	NO	NO	37.5	3	VAGINAL DELIVERY
15	1626357	Y	N	N	N	N	N	N	N	N	NO	NO	24.2	1	VAGINAL DELIVERY
16	1625360	Y	N	Y	N	N	N	N	N	N	OTHER	NO	33.1	1	LSCS
17	1619034	Y	N	N	N	N	N	Y	N	N	NO	NO	32.2	1	LSCS
18	1617179	N	N	N	Y	N	N	N	N	N	NO	NO	36	2	LSCS
19	1638852	N	N	N	N	N	N	N	N	N	NO	NO	34.4	2	LSCS
20	90247	Y	N	N	N	N	N	N	N	N	NO	NO	35.2	2	VAGINAL DELIVERY
21	90040	N	N	Y	N	Y	N	N	N	N	NO	NO	34	1	LSCS
22	1656613	N	Y (MULTIPLE)	N	N	N	N	N	N	N	NO	NO	28.4	1	VAGINAL DELIVERY
23	1590062	N	N	N	N	N	N	N	N	N	NO	NO	39	3	LSCS
24	1240981	N	N	Y	N	N	N	Y	N	N	NO	OTHER	35	2	LSCS
25	1599928	N	N	N	N	N	Y	N	N	N	NO	NO	34.5	2	LSCS
26	1610773	N	N	N	N	N	N	N	N	N	NO	NO	39.1	3	LSCS
27	1600268	Y	N	N	N	N	N	N	N	N	NO	NO	32.5	1	LSCS
28	1610826	Y	N	N	N	N	N	N	N	N	PRIMARY PPH	NO	32.4	1	LSCS
29	1591392	N	N	N	N	N	N	Y	N	N	NO	NO	34.1	2	LSCS
30	1629704	N	N	Y	N	N	N	N	N	N	NO	NO	37.5	3	VAGINAL DELIVERY
31	1657514	N	N	N	N	N	N	Y	N	N	NO	NO	34.1	2	LSCS
32	1490941	N	N	N	N	N	N	N	N	N	NO	NO	37.5	3	VAGINAL DELIVERY
33	1468383	N	N	N	N	N	N	N	N	N	NO	NO	33.4	1	LSCS
34	1358150	N	N	N	N	N	N	N	N	N	NO	OTHER	34.1	2	LSCS
35	1605533	Y	N	N	Y	N	N	N	N	N	NO	NO	36.5	2	LSCS

Sr. No.	MRD NO	INDICATION GROUPS	INDICATION OF LSCS	BIRTH WEIGHT (KG)	BIRTH WEIGHT (KG) GP	SEX	APGAR SCORE 1 MIN	APGAR SCORE 5 MIN	NICU ADMISSION	NICU STAY (days)	respiratory distress syndrome
1	1463361	AD	Absent end diastolic flow in fetus A	1.2,1.5	1	F,M	< 7,>7	>7,>7	-	21,14	YES, YES
2	1519097	FD	FETAL DISTRESS IN TWIN A	1.8,2.0	3	M,M	<7,>7	>7,>7	-	4,5	YES,NO
3	7541	DMC	ECLAMPSIA WITH DETERIORATING MATERNAL CONDITION	2.5	3	M	>7	>7	-	5	NO
4	730479	FD	Fetal distress in twin A	1.8,1.9	3	M,F	>7,<7	>7,>7	-	6,5	YES,NO
5	1491650	DMC	UNCONTROLLED BP WITH DETERIORATING MATERNAL CONDITION	1.7	2	F	<7	>7	-	14	YES
6	1494547	FD	PPROM WITH FETAL DISTRESS IN TWIN B	1.7,1.7	3	F,M	>7,<7	>7,<7	-	21,21	YES,NO
7	202108	MR	REFUSAL FOR VAGINAL DELIVERY	2.7	4	F	>7	>7	NO	-	YES
8	1663183	-	SPONTANEOUS	0.64	1	M	NA	NA	NA	DNR CONSENT	NA
9	1657514	MR	REFUSAL FOR VAGINAL DELIVERY	2.2	3	F	>7	> 7	NO	-	NO
10	979258	MR	REFUSAL FOR VAGINAL DELIVERY	2.7	4	F	>7	> 7	NO	-	NO
11	1645998	PP4 IN LABOUR	PLACENTA PREVIA TYPE4 IN LABOUR	1.86	2	F	<7	<7	-	14	YES
12	1648930	-	INDUCED	2.4	3	M	>7	> 7	NO	-	NO
13	1647674	APH + FD	APH IN LABOUR WITH FETAL DISTRESS	1.6	2	M	>7	>7	-	6	YES
14	1652050	-	SPONTANEOUS	2.5	3	F	>7	>7	-	2	NO
15	1626357	-	SPONTANEOUS	0.6,0.52	1	F,M	NA	NA	-	DNR CONSENT	NA
16	1625360	MALPRESENTATION	TWINS IN LABOUR WITH FIRST TWIN BREECH	1.6,1.5	1	M,F	>7,<7	>7,<7	-	14,12	YES,YES
17	1619034	FD	FETAL DISTRESS	1.4	1	F	< 7	>7	-	16	YES
18	1617179	ST	SCAR TENDERNESS	2.3	3	M	>7	>7	NO	-	NO
19	1638852	MALPRESENTATION	TWINS IN LABOUR WITH FIRST TWIN BREECH	1.8,1.6	3	F,M	> 7,>7	>7,>7	-	7,10	YES,NO
20	90247	-	SPONTANEOUS	2.2	3	M	< 7	>7	-	7	YES
21	90040	FD	FETAL DISTRESS	2.1	3	F	< 7	>7	-	5	NO
22	1656613	-	TERMINATION ADVISED BY PEDS TEAM, INDUCED	0.78	1	F	NA	NA	NA	-	NA
23	1590062	MR	CDMR	2.9	4	F	>7	>7	NO	-	NO
24	1240981	DMC	P.E WITH SEVERE FEATURES WITH DETERIORATING MATERNAL CONDITION	2.2	3	M	< 7	>7	-	5	YES
25	1599928	DMC	ANTEPARTUM ECLAMPSIA WITH POOR BISHOP'S SCORE WITH DETERIORATING MATERNAL CONDITION	1.9	2	F	< 7	>7	-	7	NO
26	1610773	MR	REFUSAL FOR TOLAC	2.9	4	M	>7	>7	NO	-	NO
27	1600268	MR	REFUSAL FOR VAGINAL DELIVERY	1.8	2	F	> 7	>7	-	9	YES
28	1610826	FD	TRIPLETS IN LABOUR WITH FETAL DISTRESS IN TRIPLET 3	1.1,1.2,0.9	1	F,M,M	< 7,>7,<7	> 7,> 7,<7	-	17,14,27	YES,NO,YES
29	1591392	MALPRESENTATION	TWINS IN LABOUR WITH FIRST TWIN BREECH	1.9,1.8	3	F,M	>7, >7	> 7,>7	-	7,10	NO,NO
30	1629704	-	SPONTANEOUS	3.6	4	F	> 7	>7	NO	-	NO
31	1657514	AD + FD	ABSENT END DIASTOLIC FLOW WITH FETAL DISTRESS	1.8	2	M	>7	>7	-	8	NO
32	1490941	-	SPONTANEOUS	3.3	4	F	> 7	> 7	NO	-	NO
33	1468383	APH + FD	APH WITH FETAL DISTRESS IN TWINA	1.7,2.0	3	F,F	>7,>7	>7,>7	-	7,5	NO,YES
34	1358150	AD + FD	ABSENT END DIASTOLIC FLOW WITH ANHYDRAMNIOS WITH FETAL DISTRESS	1.6	2	M	>7	>7	-	10	NO
35	1605533	PP4 IN LABOUR	PLACENTA PREVIA TYPE4 IN LABOUR	2.5	3	F	>7	>7	NO	-	NO

Sr. No.	MRD NO	NAME	AGE (YEARS)	AGE GROUP	EDUCATION	SOCIO-ECONOMIC STATUS	OCCUPATION	RESIDENTIAL ADDRESS	MARRIED FOR (YEARS)	MARRIED FOR (YEARS) GP	BOOKED	OBSTETRIC HISTORY	MODE OF CONCEPTION	GP	INDICATION FOR IVF	OVUM	SPERM
36	1497615	J	42	3	G	LM	E	R	13	2	DMCH	G2A1	IVF	1	E	S	S
37	1662486	P	35	3	PG	U	H	U	10	2	DMCH	G2P1L1	IVF	1	T	S	S
38	1661842	R	34	2	G	U	E	U	6	2	OUTSIDE	G1	IVF	1	T	S	S
39	1611715	R	36	3	G	U	E	R	9	2	DMCH	G2A1	IVF	1	M	S	D
40	1554553	P	33	2	G	UM	E	U	6	2	DMCH	G3A2	IVF	1	E	S	S
41	7856	H	32	2	PG	UM	E	R	4	1	DMCH	G3A2	IVF	1	E	S	S
42	162130	R	30	1	PG	UM	H	U	7	2	DMCH	G2P1L1	IVF	1	U	S	S
43	1655762	S	29	1	PG	LM	E	U	5	2	DMCH	G1	IVF	1	O	S	S
44	1685513	N	34	2	G	UM	E	U	4	1	DMCH	G1	IVF	1	T	S	S
45	1480085	H	31	2	PG	UM	E	U	9	2	OUTSIDE	G4P1L1A2	IVF	1	T	S	S
46	1658923	RK	26	1	PG	LM	H	R	4	1	OUTSIDE	G1	IVF	1	O	D	S
47	1696061	P	38	3	PG	U	E	U	8	2	DMCH	G3P1L1A1	IVF	1	T	S	S
48	1696623	L	34	2	PG	UM	E	R	4	1	DMCH	G1	IVF	1	M	S	S
49	1665205	A	30	1	G	UM	H	U	6	2	OUTSIDE	G2P1L1	IVF	1	U	S	S
50	1673980	R	31	2	G	LM	E	R	7	2	OUTSIDE	G2P1L1	IVF	1	E	S	S
51	1588685	RS	37	3	G	LM	H	U	5	2	DMCH	G1	SPONTANEOUS	2	-	-	-
52	1588591	P	38	3	G	LM	H	R	6	2	DMCH	G1	SPONTANEOUS	2	-	-	-
53	1563866	KK	38	3	G	L	E	U	8	2	DMCH	G2P1L1	SPONTANEOUS	2	-	-	-
54	1123046	K	31	2	G	L	E	U	4	1	DMCH	G1	SPONTANEOUS	2	-	-	-
55	660987	TA	43	3	G	LM	H	U	10	2	DMCH	G2P1L1	SPONTANEOUS	2	-	-	-
56	1540802	HK	34	2	G	LM	E	U	2	1	DMCH	G1	SPONTANEOUS	2	-	-	-
57	1592330	AD	34	2	UG	UL	H	R	5	2	OUTSIDE	G3P2L2	SPONTANEOUS	2	-	-	-
58	1591473	R	39	3	UG	UL	E	U	2	1	DMCH	G1	SPONTANEOUS	2	-	-	-
59	1024618	K	35	3	UG	LM	H	U	2	1	DMCH	G1	SPONTANEOUS	2	-	-	-
60	1577644	GK	33	2	G	LM	H	U	2	1	DMCH	G1	SPONTANEOUS	2	-	-	-
61	1155551	BM	32	2	G	LM	H	R	5	2	OUTSIDE	G2P1L1	SPONTANEOUS	2	-	-	-
62	1592933	AJ	33	2	PG	UM	H	U	2	1	OUTSIDE	G1	SPONTANEOUS	2	-	-	-
63	1594491	SR	31	2	G	UM	E	U	3	1	DMCH	G2A1	SPONTANEOUS	2	-	-	-
64	1590749	HK	31	2	G	UM	H	R	4	1	DMCH	G2A1	SPONTANEOUS	2	-	-	-
65	1596399	PR	33	2	G	LM	H	R	2	1	OUTSIDE	G1	SPONTANEOUS	2	-	-	-
66	1402095	KP	32	2	G	LM	H	R	2	1	DMCH	G1	SPONTANEOUS	2	-	-	-
67	1352283	R	42	3	UG	LM	H	U	4	1	DMCH	G1	SPONTANEOUS	2	-	-	-
68	1597670	SK	32	2	UG	U	E	R	6	2	OUTSIDE	G2P1L1	SPONTANEOUS	2	-	-	-
69	1592857	R	34	2	UG	U	H	U	5	2	DMCH	G2P1L1	SPONTANEOUS	2	-	-	-
70	1382433	SD	34	2	UG	LM	H	R	4	1	DMCH	G3A2	SPONTANEOUS	2	-	-	-

Sr. No.	MRD NO	EMBRYOS TRANSFERRED	MEDICAL HISTORY	SURGICAL HISTORY	SUBSTANCE ABUSE WIFE	SUBSTANCE ABUSE HUSBAND	BMI (Kg/m2)	BMI GROUP	NO. OF FETUS	S/C HYPOTHYROID	GDM	GESTATIONAL HTN/ P.E	PPROM	FGR	OLIGO	PLACENTA PREVIA	APH
36	1497615	2	CHRONIC HYPERTENSION	LAP MYOMECTOMY	NO	N	26	3	SINGLETON	N	N	Y	N	N	N	N	N
37	1662486	1	OTHERS	NO	NO	N	28	3	SINGLETON	N	N	N	N	N	N	N	N
38	1661842	2	NO	NO	Y	N	24	2	SINGLETON	N	N	N	N	Y	N	N	N
39	1611715	2	HYPOTHYROIDISM	LAP APPENDICECTOMY	NO	Y	26	3	SINGLETON	N	N	Y	Y	N	N	N	N
40	1554553	1	NO	NO	NO	N	28	3	SINGLETON	N	N	N	Y	N	N	N	Y
41	7856	2	NO	NO	NO	N	27	3	TRIPLETS	N	N	N	N	Y	N	N	N
42	162130	1	HYPOTHYROIDISM	NO	NO	Y	34	4	SINGLETON	N	N	N	N	N	N	N	N
43	1655762	2	NO	NO	NO	N	27	3	SINGLETON	N	Y	N	N	N	N	N	N
44	1685513	2	HYPOTHYROIDISM	NO	NO	N	25	3	SINGLETON	N	N	N	N	Y	N	N	N
45	1480085	2	OTHERS	NO	NO	N	23	2	TWINS	N	N	N	Y	N	N	N	Y
46	1658923	1	NO	OTHERS	NO	N	28	3	SINGLETON	N	N	Y	N	N	N	N	N
47	1696061	2	HYPOTHYROIDISM	NO	NO	N	30	4	SINGLETON	N	N	N	N	N	N	N	N
48	1696623	2	NO	NO	NO	Y	29	3	TWINS	N	N	Y	N	Y	N	N	N
49	1665205	2	CHRONIC HYPERTENSION	NO	NO	N	28	3	SINGLETON	N	N	N	N	N	N	N	N
50	1673980	2	DM	NO	NO	N	25	3	SINGLETON	N	N	N	Y	N	N	N	N
51	1588685	-	NO	NO	NO	N	23	2	SINGLETON	N	Y	N	N	N	N	N	N
52	1588591	-	NO	NO	NO	N	27	3	SINGLETON	Y	N	Y	N	N	N	N	N
53	1563866	-	NO	NO	NO	N	27	3	SINGLETON	N	N	N	N	N	N	N	Y
54	1123046	-	NO	NO	NO	N	28	3	SINGLETON	N	N	N	N	N	N	N	N
55	660987	-	HYPOTHYROIDISM	NO	NO	N	29	3	SINGLETON	N	N	N	N	N	N	N	N
56	1540802	-	OTHERS	NO	NO	N	23	2	SINGLETON	N	N	N	N	Y	Y	N	N
57	1592330	-	NO	NO	NO	N	22	1	SINGLETON	N	N	N	N	N	N	N	Y
58	1591473	-	NO	OTHERS	NO	N	25	3	SINGLETON	N	Y	N	N	N	N	N	N
59	1024618	-	NO	NO	NO	N	22	1	SINGLETON	N	Y	Y	N	N	N	N	N
60	1577644	-	NO	NO	NO	N	24.5	2	SINGLETON	Y	N	N	N	N	N	N	N
61	1155551	-	HYPOTHYROIDISM	NO	NO	N	27	3	TWINS	N	N	N	N	N	N	N	N
62	1592933	-	NO	NO	NO	N	25	3	SINGLETON	N	N	Y	N	N	N	N	N
63	1594491	-	HYPOTHYROIDISM	NO	Y	N	23	2	SINGLETON	N	N	N	Y	Y	N	N	N
64	1590749	-	NO	LAP APPENDICECTOMY	NO	N	25.5	3	SINGLETON	N	N	N	Y	N	N	N	N
65	1596399	-	NO	NO	NO	N	26	3	SINGLETON	N	N	N	N	N	N	N	N
66	1402095	-	NO	NO	NO	N	26.5	3	SINGLETON	N	N	N	Y	Y	N	N	N
67	1352283	-	NO	NO	NO	N	27	3	SINGLETON	N	N	N	N	N	N	N	N
68	1597670	-	HYPOTHYROIDISM	NO	NO	N	26	3	SINGLETON	N	N	Y	N	N	N	N	N
69	1592857	-	NO	NO	NO	N	23	2	SINGLETON	N	N	N	N	N	N	N	N
70	1382433	-	HYPOTHYROIDISM	NO	NO	N	22	1	SINGLETON	N	Y	N	N	N	N	N	N

Sr. No.	MRD NO	PRETERM LABOUR	FETAL ANOMALIES	POST PARTUM CHRONIC HTN	POST PARTUM DM	PUERPERAL SEPSIS	ECLAMPSIA	ICP	IUFD	POLYHYDRAMNIOS	INTRAPARTUM	RETAINED PLACENTA/OTHER POSTPARTUM	POG AT DELIVERY	PRETERM	MODE OF DELIVERY
36	1497615	N	N	N	N	N	N	N	N	N	NO	NO	34.5	2	LSCS
37	1662486	N	N	N	N	N	N	N	N	N	NO	NO	38.4	3	VAGINAL DELIVERY
38	1661842	Y	N	N	N	N	N	N	N	N	NO	NO	35.4	2	LSCS
39	1611715	Y	N	Y	N	N	N	N	N	N	NO	NO	36.3	2	LSCS
40	1554553	N	N	N	N	N	N	N	N	N	NO	NO	34.5	2	LSCS
41	7856	N	N	N	N	N	N	N	N	N	NO	NO	28.1	1	LSCS
42	162130	Y	N	N	N	N	N	N	N	N	NO	NO	33.6	1	LSCS
43	1655762	N	N	N	N	N	N	N	N	N	NO	NO	37.5	3	LSCS
44	1685513	Y	N	N	N	N	N	N	N	N	NO	NO	26.1	1	VAGINAL DELIVERY
45	1480085	N	N	N	N	N	N	N	Y	N	NO	NO	35.5	2	LSCS
46	1658923	N	Y (DUODENAL ATRESIA)	N	N	Y	N	N	N	Y	NO	NO	35.4	2	LSCS
47	1696061	N	N	N	N	N	N	N	N	N	NO	NO	38	3	VAGINAL DELIVERY
48	1696623	N	N	N	N	N	N	N	Y	N	NO	NO	26.2	1	LSCS
49	1665205	N	N	N	N	N	N	N	N	N	NO	NO	37.1	3	LSCS
50	1673980	Y	N	N	Y	N	N	N	N	Y	NO	NO	36.2	2	LSCS
51	1588685	N	N	N	N	N	N	N	N	N	NO	NO	39.1	3	VAGINAL DELIVERY
52	1588591	N	N	N	N	N	N	Y	N	N	NO	NO	36	2	VAGINAL DELIVERY
53	1563866	N	N	N	N	N	N	Y	N	N	NO	NO	32.4	1	LSCS
54	1123046	N	N	N	N	N	N	N	N	N	NO	NO	37.5	3	VAGINAL DELIVERY
55	660987	N	N	N	N	N	N	N	N	N	NO	NO	39.4	3	VAGINAL DELIVERY
56	1540802	N	N	N	N	N	N	N	N	N	NO	NO	37.2	3	LSCS
57	1592330	N	N	N	N	N	N	N	N	N	NO	NO	34	1	LSCS
58	1591473	N	N	N	N	N	N	N	N	N	NO	NO	38.5	3	VAGINAL DELIVERY
59	1024618	N	N	N	N	N	N	N	N	N	NO	NO	37.1	3	VAGINAL DELIVERY
60	1577644	N	N	N	N	N	N	N	N	N	NO	NO	39	3	VAGINAL DELIVERY
61	1155551	N	N	N	N	N	N	N	N	N	NO	NO	37.2	3	LSCS
62	1592933	N	N	Y	N	N	N	N	Y	N	NO	NO	28.4	1	VAGINAL DELIVERY
63	1594491	N	N	N	N	N	N	N	N	N	NO	NO	34.1	2	VAGINAL DELIVERY
64	1590749	Y	N	N	N	N	N	N	N	N	NO	NO	35.5	2	LSCS
65	1596399	Y	N	N	N	N	N	Y	N	N	NO	NO	35.3	2	LSCS
66	1402095	N	N	N	N	N	N	N	N	N	NO	NO	36.2	2	LSCS
67	1352283	N	N	N	N	N	N	N	N	N	OTHER	NO	39.2	3	VAGINAL DELIVERY
68	1597670	N	N	N	N	N	Y	N	N	N	NO	NO	35.2	2	LSCS
69	1592857	N	N	N	N	N	N	N	N	N	NO	NO	37.2	3	VAGINAL DELIVERY
70	1382433	N	N	N	N	N	N	N	N	N	NO	NO	37.1	3	VAGINAL DELIVERY

Sr. No.	MRD NO	INDICATION GROUPS	INDICATION OF LSCS	BIRTH WEIGHT (KG)	BIRTH WEIGHT (KG) GP	SEX	APGAR SCORE 1 MIN	APGAR SCORE 5 MIN	NICU ADMISSION	NICU STAY (days)	respiratory distress syndrome
36	1497615	DMC	UNCONTROLLED BP WITH DETERIORATING MATERNAL CONDITION	1.4	1	F	>7	>7	-	5	NO
37	1662486	-	SPONTANEOUS	2.9	4	M	>7	>7	NO	-	NO
38	1661842	MR	REFUSAL FOR VAGINAL DELIVERY	2.3	3	M	>7	> 7	NO	-	NO
39	1611715	MR	REFUSAL FOR VAGINAL DELIVERY	2.5	3	F	>7	> 7	NO	-	NO
40	1554553	APH + FD	APH WITH FETAL DISTRESS	2.1	3	F	>7	>7	-	8	YES
41	7856	AD	REVERSAL END DIASTOLIC FLOW IN FETUS 3	0.7,0.7,0.5	1	M,M,F	<7,>7,<7	>7,>7,<7	-	40,40,45	YES,YES,YES
42	162130	MR	REFUSAL FOR TOLAC	2.1	3	M	>7	>7	-	10	NO
43	1655762	FD	FETAL DISTRESS	3.1	4	F	>7	> 7	NO	-	NO
44	1685513	-	SPONTANEOUS	0.7	1	F	<7	<7	-	52	YES
45	1480085	APH + FD	APH WITH FETAL DISTRESS	2.8,2.5	4	M,M	>7,NA	>7,NA	-	4, NA	YES, NA
46	1658923	MR	REFUSAL FOR VAGINAL DELIVERY	2.3	3	F	> 7	>7	-	11	YES
47	1696061	-	SPONTANEOUS	3.2	4	M	> 7	> 7	NO	-	NO
48	1696623	DMC	DETERIORATING MATERNAL CONDITION	0.7,0.8	1	F,M	>7, NA	>7,NA	-	60	YES, NA
49	1665205	MSL + FD	MECONIUM STAINED LIQUOR WITH FETAL DISTRESS	2.6	4	M	>7	>7	-	3	YES
50	1673980	MR	REFUSAL FOR VAGINAL DELIVERY	2.9	4	F	>7	>7	-	2	NO
51	1588685	-	INDUCED	3.1	4	M	>7	> 7	NO	-	NO
52	1588591	-	SPONTANEOUS	2.4	3	F	> 7	> 7	NO	-	NO
53	1563866	APH + FD	APH WITH FETAL DISTRESS	1.9	2	M	>7	>7	-	14	YES
54	1123046	-	SPONTANEOUS	2.4	3	M	> 7	> 7	NO	-	NO
55	660987	-	INDUCED	2.9	4	F	> 7	> 7	NO	-	NO
56	1540802	FGR + FD	FGR1 WITH OLIGOHYDRAMNIOS WITH FETAL DISTRESS	2.2	3	F	< 7	>7	-	5	NO
57	1592330	APH + FD	APH WITH FETAL DISTRESS	2.2	3	M	< 7	>7	-	7	YES
58	1591473	-	SPONTANEOUS	3.2	4	F	> 7	> 7	NO	-	NO
59	1024618	-	SPONTANEOUS	2.9	4	M	> 7	> 7	NO	-	NO
60	1577644	-	INDUCED	3.2	4	F	> 7	> 7	NO	-	NO
61	1155551	MALPRESENTATION	TWINS IN LABOUR WITH FIRST TWIN BREECH	2.2,2.3	4	F,M	> 7,>7	< 7,<7	-	4,3	NO,NO
62	1592933	-	INDUCED	1.1	1	F	NA	NA	-	NA	NA
63	1594491	-	SPONTANEOUS	1.9	2	F	> 7	>7	-	5	NO
64	1590749	MR	REFUSAL FOR VAGINAL DELIVERY	2.2	3	M	> 7	> 7	NO	-	NO
65	1596399	MR	REFUSAL FOR VAGINAL DELIVERY	2.3	3	F	> 7	> 7	-	20	YES
66	1402095	AD + FD	ABSENT END DIASTOLIC FLOW PLUS FETAL DISTRESS	2.5	3	F	> 7	> 7	-	17	YES
67	1352283	-	INDUCED	2.7	4	F	> 7	> 7	NO	-	NO
68	1597670	DMC	ECLAMPSIA WITH DETERIORATING MATERNAL CONDITION	2.4	3	M	>7	>7	-	7	YES
69	1592857	-	SPONTANEOUS	2.8	4	F	> 7	> 7	NO	-	NO
70	1382433	-	SPONTANEOUS	2.9	4	F	> 7	> 7	NO	-	NO

Sr. No.	MRD NO	NAME	AGE (YEARS)	AGE GROUP	EDUCATION	SOCIO-ECONOMIC STATUS	OCCUPATION	RESIDENTIAL ADDRESS	MARRIED FOR (YEARS)	MARRIED FOR (YEARS) GP	BOOKED	OBSTETRIC HISTORY	MODE OF CONCEPTION	GP	INDICATION FOR IVF	OVUM	SPERM
71	1597664	GK	32	2	G	U	E	R	2	1	DMCH	G1	SPONTANEOUS	2	-	-	-
72	22799	M	35	3	G	LM	H	R	5	2	OUTSIDE	G2P1L1	SPONTANEOUS	2	-	-	-
73	1598399	D	32	2	G	UM	E	U	2	1	DMCH	G1	SPONTANEOUS	2	-	-	-
74	1599701	JK	30	1	G	LM	H	U	4	1	DMCH	G3P1L1A1	SPONTANEOUS	2	-	-	-
75	1600884	PR	35	3	G	U	H	R	6	2	OUTSIDE	G3P2L2	SPONTANEOUS	2	-	-	-
76	1600118	SK	32	2	G	U	H	R	5	2	DMCH	G2P1L1	SPONTANEOUS	2	-	-	-
77	1025580	S	32	2	UG	UM	H	U	2	1	DMCH	G2A1	SPONTANEOUS	2	-	-	-
78	1589122	S	30	1	UG	LM	E	R	2	1	OUTSIDE	G1	SPONTANEOUS	2	-	-	-
79	1601076	S	37	3	UG	LM	H	U	3	1	DMCH	G2A1	SPONTANEOUS	2	-	-	-
80	1601831	RG	32	2	G	UL	E	R	2	1	DMCH	G1	SPONTANEOUS	2	-	-	-
81	1496722	D	35	3	G	LM	H	U	2	1	DMCH	G1	SPONTANEOUS	2	-	-	-
82	1600024	J	35	3	PG	UM	H	R	3	1	OUTSIDE	G1	SPONTANEOUS	2	-	-	-
83	1603041	SK	43	3	G	LM	E	R	8	2	DMCH	G2P1L1	SPONTANEOUS	2	-	-	-
84	1603353	MK	30	1	G	LM	E	R	2	1	DMCH	G1	SPONTANEOUS	2	-	-	-
85	1487893	RD	34	2	G	UM	H	R	5	2	OUTSIDE	G2P1L1	SPONTANEOUS	2	-	-	-
86	1474197	S	40	3	UG	LM	H	U	3	1	DMCH	G2A1	SPONTANEOUS	2	-	-	-
87	1605741	R	33	2	G	UL	E	U	4	1	DMCH	G2P1L1	SPONTANEOUS	2	-	-	-
88	1608500	SS	32	2	G	LM	H	R	2	1	DMCH	G1	SPONTANEOUS	2	-	-	-
89	1605746	RK	37	3	G	UL	E	U	3	1	OUTSIDE	G2A1	SPONTANEOUS	2	-	-	-
90	1607834	SM	32	2	G	U	H	R	3	1	OUTSIDE	G2A1	SPONTANEOUS	2	-	-	-
91	1576405	NB	30	1	PG	UM	E	R	4	1	OUTSIDE	G2P1L1	SPONTANEOUS	2	-	-	-
92	1608551	KJ	28	1	G	U	H	U	6	2	DMCH	G5P2L2A2	SPONTANEOUS	2	-	-	-
93	1602892	GG	27	1	PG	U	E	R	2	1	DMCH	G1	SPONTANEOUS	2	-	-	-
94	1009000	A	32	2	PG	UM	H	U	2	1	DMCH	G1	SPONTANEOUS	2	-	-	-
95	1527177	AK	29	1	G	UM	E	U	8	2	DMCH	G8P1L1A6	SPONTANEOUS	2	-	-	-
96	1510456	DS	24	1	UG	LM	H	R	2	1	DMCH	G1	SPONTANEOUS	2	-	-	-
97	1304638	SK	36	3	UG	UM	H	U	5	2	DMCH	G3P1L1A1	SPONTANEOUS	2	-	-	-
98	1609212	RR	32	2	UG	UM	H	R	2	1	OUTSIDE	G1	SPONTANEOUS	2	-	-	-
99	80230	SK	28	1	UG	LM	H	R	4	1	DMCH	G2P1L1	SPONTANEOUS	2	-	-	-
100	77303	KJ	29	1	UG	LM	H	U	4	1	DMCH	G2P1L1	SPONTANEOUS	2	-	-	-

Sr. No.	MRD NO	EMBRYOS TRANSFERRED	MEDICAL HISTORY	SURGICAL HISTORY	SUBSTANCE ABUSE WIFE	SUBSTANCE ABUSE HUSBAND	BMI (Kg/m2)	BMI GROUP	NO. OF FETUS	S/C HYPOTHYROID	GDM	GESTATIONAL HTN/ P.E	PPROM	FGR	OLIGO	PLACENTA PREVIA	APH
71	1597664	-	NO	NO	NO	Y	24	2	SINGLETON	N	N	N	N	N	N	N	N
72	22799	-	NO	LAP APPENDICECTOMY	NO	N	26	3	SINGLETON	N	N	N	N	N	N	Y	N
73	1598399	-	NO	NO	NO	N	24	2	TWINS	N	N	N	N	Y	N	N	N
74	1599701	-	NO	NO	NO	N	24	2	SINGLETON	N	N	N	N	N	N	N	N
75	1600884	-	NO	NO	NO	N	23.5	2	TWINS	N	N	N	N	N	N	N	N
76	1600118	-	NO	NO	NO	N	25.5	3	SINGLETON	Y	N	N	N	N	N	Y	N
77	1025580	-	HYPOTHYROIDISM	NO	NO	Y	26	3	SINGLETON	N	N	N	N	N	N	N	N
78	1589122	-	NO	NO	NO	N	27	3	SINGLETON	N	N	Y	N	N	N	N	N
79	1601076	-	CHRONIC HYPERTENSION	NO	NO	N	24	2	SINGLETON	N	N	N	N	N	N	N	N
80	1601831	-	NO	NO	NO	N	24	2	TWINS	Y	N	Y	N	N	N	N	N
81	1496722	-	NO	LAP APPENDICECTOMY	NO	Y	22.5	1	SINGLETON	N	N	N	N	N	N	N	N
82	1600024	-	NO	NO	NO	Y	23	2	SINGLETON	N	N	N	N	N	Y	N	N
83	1603041	-	NO	NO	NO	N	24	2	SINGLETON	N	N	N	N	Y	Y	N	N
84	1603353	-	HYPOTHYROIDISM	NO	NO	N	23	2	SINGLETON	N	N	N	N	N	Y	N	N
85	1487893	-	NO	NO	NO	Y	25	3	SINGLETON	N	N	N	N	N	N	N	N
86	1474197	-	NO	NO	NO	N	27	3	TWINS	N	N	N	Y	N	N	N	N
87	1605741	-	NO	NO	NO	N	29	3	SINGLETON	N	N	N	N	N	N	Y	N
88	1608500	-	NO	LAP APPENDICECTOMY	NO	N	27	3	SINGLETON	N	N	N	Y	N	N	N	N
89	1605746	-	OTHERS	NO	NO	N	28.5	3	SINGLETON	Y	N	N	N	N	N	N	N
90	1607834	-	NO	NO	NO	N	27	3	SINGLETON	N	N	N	N	N	N	N	N
91	1576405	-	HYPOTHYROIDISM	NO	NO	N	26	3	SINGLETON	N	N	N	N	N	N	N	N
92	1608551	-	NO	OTHERS	NO	N	25.5	3	SINGLETON	N	N	N	N	N	N	N	N
93	1602892	-	NO	NO	NO	N	27	3	SINGLETON	N	N	N	N	N	N	N	N
94	1009000	-	HYPOTHYROIDISM	NO	NO	N	28.5	3	SINGLETON	N	N	N	N	N	N	N	N
95	1527177	-	NO	NO	NO	N	24	2	SINGLETON	N	Y	N	N	N	N	N	N
96	1510456	-	NO	NO	Y	N	23	2	SINGLETON	N	N	N	N	N	N	N	N
97	1304638	-	NO	NO	NO	N	23	2	SINGLETON	N	N	N	N	N	N	N	N
98	1609212	-	NO	NO	NO	N	24.5	2	SINGLETON	N	Y	N	N	N	N	N	N
99	80230	-	OTHERS	NO	NO	N	24.5	2	SINGLETON	N	N	N	N	N	N	N	N
100	77303	-	NO	NO	Y	N	25	3	SINGLETON	N	N	N	N	N	N	N	N

Sr. No.	MRD NO	PRETERM LABOUR	FETAL ANOMALIES	POST PARTUM CHRONIC HTN	POST PARTUM DM	PUERPERAL SEPSIS	ECLAMPSIA	ICP	IUFD	POLYHYDRAMNIOS	INTRAPARTUM	RETAINED PLACENTA/OTHER POSTPARTUM	POG AT DELIVERY	PRETERM	MODE OF DELIVERY
71	1597664	N	N	N	N	N	N	N	N	N	NO	NO	38	3	VAGINAL DELIVERY
72	22799	N	N	N	N	N	N	N	N	N	PLACENTA ACCRETA	NO	36.6	2	LSCS
73	1598399	N	N	N	N	N	N	N	N	N	NO	NO	32	1	LSCS
74	1599701	N	N	N	N	N	N	N	N	N	NO	NO	37.2	3	VAGINAL DELIVERY
75	1600884	N	N	N	N	N	N	N	N	N	NO	NO	33.2	1	LSCS
76	1600118	Y	N	N	N	N	N	N	N	N	NO	NO	36.1	2	LSCS
77	1025580	N	N	N	N	N	N	N	N	N	NO	NO	39	3	VAGINAL DELIVERY
78	1589122	N	N	N	N	N	N	N	N	N	NO	NO	37.6	3	VAGINAL DELIVERY
79	1601076	N	N	N	N	N	N	N	N	N	NO	NO	37.3	3	LSCS
80	1601831	N	N	N	N	N	N	N	N	N	NO	NO	35.2	2	LSCS
81	1496722	N	N	N	N	N	N	N	N	N	NO	NO	38.2	3	VAGINAL DELIVERY
82	1600024	N	N	N	N	N	N	N	N	N	NO	NO	35.1	2	VAGINAL DELIVERY
83	1603041	N	N	N	N	N	N	N	N	N	NO	NO	34.5	2	LSCS
84	1603353	Y	N	N	N	N	N	N	N	N	NO	NO	33.1	1	LSCS
85	1487893	N	N	N	N	N	N	N	N	N	NO	NO	38.3	3	VAGINAL DELIVERY
86	1474197	N	N	N	N	N	N	N	N	N	NO	OTHER	36.3	2	VAGINAL DELIVERY
87	1605741	N	N	N	N	N	N	N	N	N	NO	NO	36.6	2	LSCS
88	1608500	N	N	N	N	N	N	N	N	N	NO	NO	34.6	2	LSCS
89	1605746	N	N	N	N	N	N	N	N	N	NO	NO	37.2	3	VAGINAL DELIVERY
90	1607834	N	N	N	N	N	N	N	N	N	NO	NO	38.1	3	VAGINAL DELIVERY
91	1576405	N	N	N	N	N	N	N	N	N	NO	NO	38.2	3	VAGINAL DELIVERY
92	1608551	N	N	N	N	N	N	N	N	N	NO	NO	37.5	3	VAGINAL DELIVERY
93	1602892	N	N	N	N	N	N	N	N	N	NO	NO	40	3	VAGINAL DELIVERY
94	1009000	N	N	N	N	N	N	N	N	N	NO	NO	38	3	VAGINAL DELIVERY
95	1527177	Y	N	N	Y	N	N	N	N	N	NO	NO	32.5	1	LSCS
96	1510456	N	N	N	N	N	N	N	N	N	NO	NO	37.2	3	LSCS
97	1304638	N	N	N	N	N	N	N	N	N	NO	NO	38.2	3	VAGINAL DELIVERY
98	1609212	N	N	N	Y	Y	N	N	N	N	NO	NO	38.5	3	VAGINAL DELIVERY
99	80230	N	N	N	N	N	N	N	N	N	NO	NO	37.6	3	VAGINAL DELIVERY
100	77303	N	N	N	N	N	N	N	N	N	NO	NO	38.5	3	VAGINAL DELIVERY

Sr. No.	MRD NO	INDICATION GROUPS	INDICATION OF LSCS	BIRTH WEIGHT (KG)	BIRTH WEIGHT (KG) GP	SEX	APGAR SCORE 1 MIN	APGAR SCORE 5 MIN	NICU ADMISSION	NICU STAY (days)	respiratory distress syndrome
71	1597664	-	SPONTANEOUS	3	4	M	> 7	> 7	NO	-	NO
72	22799	PP4 IN LABOUR	PLACENTA PREVIA TYPE4 IN LABOUR	2.6	4	M	> 7	> 7	NO	-	NO
73	1598399	FGR + FD	FGR2 IN TWIN B WITH FETAL DISTRESS	1.6,1.2	1	F,M	>7,<7	>7,<7	-	15,21	YES,YES
74	1599701	-	SPONTANEOUS	2.8	4	F	> 7	> 7	NO	-	NO
75	1600884	MALPRESENTATION	TWINS IN LABOUR WITH TWIN A BREECH	1.8,1.6	3	M,M	> 7,<7	>7,<7	-	7,5	YES,YES
76	1600118	PP4 IN LABOUR	PLACENTA PREVIA 4 IN LABOUR	2.5	3	F	>7	>7	-	-	NO
77	1025580	-	INDUCED	3.3	4	F	> 7	> 7	NO	-	NO
78	1589122	-	SPONTANEOUS	2.8	4	M	> 7	> 7	NO	-	NO
79	1601076	MALPRESENTATION	PRIMI WITH BREECH IN LABOUR	2.8	4	M	> 7	> 7	NO	-	YES
80	1601831	MALPRESENTATION	TWINS IN LABOUR WITH TWIN A BREECH	2.1,1.9	3	F,F	> 7,<7	> 7,<7	-	6,10	NO,YES
81	1496722	-	SPONTANEOUS	3.1	4	M	> 7	> 7	NO	-	NO
82	1600024	-	SPONTANEOUS	2.6	4	M	> 7	> 7	NO	-	NO
83	1603041	AD	FGR2 WITH OLIGOHYDRAMNIOS	1.8	2	F	>7	>7	-	8	NO
84	1603353	MALPRESENTATION	PRIMI WITH BREECH IN LABOUR	2	2	F	>7	>7	-	7	NO
85	1487893	-	SPONTANEOUS	3.1	4	M	> 7	> 7	NO	-	NO
86	1474197	-	SPONTANEOUS	2.2,2.1	4	F,M	> 7,>7	> 7,>7	-	4,7	NO,NO
87	1605741	PP4 IN LABOUR	PLACENTA PREVIA TYPE4 IN LABOUR	2.8	4	F	> 7	> 7	NO	-	NO
88	1608500	FD	FETAL DISTRESS	2.1	3	M	>7	> 7	-	5	NO
89	1605746	-	SPONTANEOUS	2.8	4	M	> 7	> 7	NO	-	NO
90	1607834	-	SPONTANEOUS	3.1	4	F	> 7	> 7	NO	-	NO
91	1576405	-	SPONTANEOUS	3.2	4	F	> 7	> 7	NO	-	NO
92	1608551	-	SPONTANEOUS	2.9	4	M	> 7	> 7	NO	-	NO
93	1602892	-	INDUCED	3.4	4	F	> 7	> 7	NO	-	NO
94	1009000	-	SPONTANEOUS	2.8	4	F	> 7	> 7	NO	-	NO
95	1527177	MR	REFUSAL FOR VAGINAL DELIVERY	1.8	2	M	<7	>7	-	10	YES
96	1510456	FD	FETAL DISTRESS	2.1	3	M	>7	>7	-	2	NO
97	1304638	-	SPONTANEOUS	3	4	M	> 7	> 7	NO	-	NO
98	1609212	-	SPONTANEOUS	2.8	4	F	> 7	> 7	NO	-	NO
99	80230	-	SPONTANEOUS	3.1	4	M	> 7	> 7	NO	-	NO
100	77303	-	SPONTANEOUS	2.8	4	M	> 7	> 7	NO	-	NO

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The Principal
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Ludhiana

Subject:: Approval of Plan of Thesis.

This is to inform you that the Faculty of Medical Sciences in its meeting held on 25.09.2023 has approved the plan of thesis of **Romi**, a student of your college for **MD (Obstetrics & Gynaecology)** along with the names of Supervisor/Co-Supervisor as under:-

Topic Plan of Thesis
Maternal and perinatal outcomes in ivf pregnancies compared to spontaneously conceived pregnancies .

Supervisor
Dr. Pooja Tandon
Assoc. Prof.,
Dept. of Obstetrics & Gynaecology,

Co-Supervisor:-
Dr. Ashima Taneja
Prof. & Head
Dept. of Obstetrics & Gynaecology

The student may submit the thesis in triplicate alongwith the plan in triplicate also, to the Controller of Examinations, BFUHS, Faridkot, at least six months before the commencement of theory examination, if he/she is otherwise eligible to take the examination. He /She may be directed to attach a photocopy of this letter with the forwarding letter while submitting thesis in the University along with the letter of approval of University for change of supervisor/Co-Supervisor, change of topic, if any.

Controller of Examinations

Note :

1. *If any discrepancy found regarding topic of thesis or Supervisor/Co-Supervisor, inform undersigned within one month after issue of this letter.*

MATERNAL AND PERINATAL OUTCOMES IN IVF PREGNANCIES COMPARED TO SPONTANEOUSLY CONCEIVED PREGNANCIES

THESIS PROPOSAL

FOR APPROVAL OF SUBJECT OF THESIS TO BE SUBMITTED IN

PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

MD

IN

OBSTETRICS & GYNAECOLOGY

OF THE

BABA FARID UNIVERSITY OF HEALTH SCIENCES

FARIDKOT

SEPTEMBER, 2022

Dr. ROMI

DEPARTMENT OF OBSTETRICS & GYNAECOLOGY
DAYANAND MEDICAL COLLEGE AND HOSPITAL
LUDHIANA

ABSTRACT OF PLAN OF THESIS

Title	MATERNAL AND PERINATAL OUTCOMES IN IVF PREGNANCIES COMPARED TO SPONTANEOUSLY CONCEIVED PREGNANCIES
For the degree of	MS OBSTETRICS AND GYNAECOLOGY
Name of the candidate	DR. ROMI
Supervisor	DR. POOJA TANDON
Co-supervisor	DR. ASHIMA TANEJA
Institution	Dayanand Medical College & Hospital, Ludhiana
University	Baba Farid University of Health Sciences, Faridkot

Introduction:
The aim of IVF is to maximize success along with safety both short term and long term to the woman and offspring. With IVF being on the uprise and more children being born as a result, there is more interest in health outcomes of IVF conceived pregnancies and children.

Aim of Study: The aim of the study is to analyse age and parity matched maternal and perinatal outcomes in IVF and spontaneously conceived pregnancy.

Materials & methods: The study would consist of selected women who deliver at DMCH between September 2022- September 2023. Study group would consist of 50 patients who conceived by means of IVF. Control group would consist of 50 women who conceived spontaneously and delivered within the same time period matched by age and parity.

Clinical Significance: Assisted reproductive technology has developed rapidly during the past 30 years. Since the introduction of the method, various concerns have been raised regarding the safety aspects of IVF pregnancies and children. So, it becomes more pertinent to evaluate risk associated with them.

Keywords: IVF (In Vitro Fertilisation), Low birth weight, Perinatal outcome, Preterm birth, infertility, maternal

Romi

(Signature)
Candidate

(Signature)
Co-supervisor

(Signature)
Supervisor

(Signature)
Principal

CERTIFICATE OF FACILITIES AVAILABLE

This is to certify that the facilities for work on the subject of thesis titled "**MATERNAL AND PERINATAL OUTCOMES IN IVF PREGNANCIES COMPARED TO SPONTANEOUSLY CONCEIVED PREGNANCIES**" exist in the Department of OBSTETRICS AND GYNAECOLOGY, DMC&H, Ludhiana and will be provided to be candidate of will be provided to the candidate. We will see that the data being included in the thesis are genuine and is collected by the candidate himself/herself under our supervision and guidance.

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Date : _____

APPROVAL PROFORMA BY RESEARCH & ETHICAL COMMITTEE
DAYANAND MEDICAL COLLEGE & HOSPITAL, LUDHIANA

Name of candidate	Dr. Romi
Department	Obstetrics and Gynaecology
Topic of Thesis	Maternal and perinatal outcomes in IVF pregnancies compared to spontaneously conceived pregnancies
Likely date of appearing in PG examination	May/June, 2024
Date of enrollment	7th March, 2022
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	Dr. Gagandeep Singh (Secretary, Ethics Committee Professor & Head, Neurology)

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Dr. Sandeep Puri
Chairperson
Research Committee

Chairperson
Research Committee

Approved: Yes / ~~No~~

Prof. Arvind Malhotra
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Ethics Committee

Chairperson
Ethics Committee

BABA FARID UNIVERSITY OF HEALTH SCIENCES, FARIDKOT
PROFORMA FOR REGISTRATION OF SUBJECT FOR DISSERTATION

1	NAME OF THE CANDIDATE AND ADDRESS	Dr. ROMI HOUSE NO. 108, VAID KAPOOR CHAND STREET, JAWAHRKE ROAD, MANSA.
2	NAME OF THE INSTITUTE	DAYANAND MEDICAL COLLEGE AND HOSPITAL, LUDHIANA
3	COURSE OF STUDY AND SUBJECT	MS OBSTETRICS AND GYNAECOLOGY
4	DATE OF ADMISSION OF COURSE	7th MARCH, 2022
5	TITLE OF THE TOPIC	MATERNAL AND PERINATAL OUTCOMES IN IVF PREGNANCIES COMPARED TO SPONTANEOUSLY CONCEIVED PREGNANCIES

6. BRIEF RESUME OF THE INTENDED WORK

6.1 NEED FOR THE STUDY

Infertility has opened the door to huge increase in the demand of IVF. ART is increasingly being used to treat infertile couples with both male and female infertility factors. Reproductive medicine has come a long way since then, and there have been dramatic advances in the field, such that biological parenthood is a reality for many couples for whom adoption was the only available option in the past. In vitro fertilization (IVF) is the most common form of assisted reproductive technology and is used in the management of patients with difficulty undergoing conception. IVF is a long process and a big investment of physical and emotional energy.

The most important cause of female infertility is age, primarily through age related decline in ovarian reserve. Other common causes of female infertility are ovulatory disorders, tubal factors, endometriosis, cervical factors and unexplained infertility. Common causes of male infertility are sperm production issues, genetic factors and ejaculation dysfunctions, lifestyle factors smoking, alcohol and drug use.

The workup for couples experiencing infertility includes an assessment of ovulatory function, ovarian reserve, uterine cavity, tubal patency, and a semen analysis.

Patients who may benefit from IVF include those with obstructed or damaged fallopian tubes, endometriosis, hostile cervical mucus, high titers of anti-sperm antibodies, male factors (low sperm counts, low motility, low normal morphology), and or unexplained infertility.

The process revolves around the etiology, evaluation, and the role of interprofessional team in management strategies for IVF. Assisted reproductive technology procedures involve manipulation of eggs, sperm, and embryos in the laboratory, for the purpose of establishing a pregnancy. The IVF-ET consists of several steps, including controlled ovarian hyperstimulation (COH), oocyte retrieval, fertilization of sperm and eggs through spontaneous interaction, embryo culture for 2–5 days, and intrauterine embryo transfer.

It requires a team consisting of physicians, nurses, embryologists, and other personnel in order to provide successful treatment to patients. it is important to note the increased psychological stress that many patients face when going through IVF. Patients often do not have adequate emotional support from their close social contacts, and research suggests such lack of support leads to lower conception rates. It is, therefore, critical that all members of the treatment team take the time to have open lines of communication with the patients and provide patient-centered care.

Pregnancies that occur after infertility treatment, particularly after assisted reproduction, constitute high-risk pregnancies. Occurrences of conditions such as high blood pressure, preeclampsia, growth retardation and bleeding have been reported to be higher in comparison with the norm of spontaneously entered pregnancies. Furthermore, pregnancies resulting from in vitro fertilisation (IVF) have significantly higher rates of requiring induced labor or caesarean section. The rate of premature births is much higher than the average for all pregnancies.

The causes are multifactorial. First, there are factors unrelated to the treatment method, such as the characteristics of the population – age of the parents, cause of infertility and its probable genetic background. Secondly, there are various factors strictly linked to IVF technique – the method of fertilization (IVF or ICSI), culture media, cryopreservation methods or embryo selection methods. Finally, it is known that ovarian stimulation leads to the altered endocrine profiles of the patients during fresh embryo transfer procedures, which may influence implantation and early placentation.

We plan to comprehensively study the effects of high technology infertility treatments on maternal and perinatal outcomes. So, it is important to evaluate if there is any increase in maternal and perinatal risk in IVF pregnancies after age and parity matching.

This will allow appropriate guidance to be given for clinical practice. The aim of the research is to improve clinical practice and optimize the chances of people with fertility problems achieving parenthood.

In this study we plan to analyse the age and parity matched maternal and perinatal outcomes in IVF and spontaneously conceived pregnancies.

6.2 REVIEW OF LITERATURE

Infertility is defined as inability to conceive even after 12 months of unprotected intercourse. If the woman is above 35 years, we begin the evaluation after 6 months of unprotected intercourse. The use of assisted reproductive technology is on the rise throughout the world. Concerns have been raised over an increased risk of adverse maternal and perinatal outcomes in Assisted reproductive technology (ART) populations compared with natural conceptions.

ART which includes In vitro fertilization (IVF) is increasingly being used to treat infertile couples with both female and male infertility factors. IVF is widely applied in clinical work and the safety of this technique is of important clinical value Assisted reproductive technology procedures involve manipulation of eggs, sperm, and embryos in the laboratory, for the purpose of establishing a pregnancy. The IVF- embryo transfer consists of several steps, including controlled ovarian hyperstimulation (COH), oocyte retrieval, fertilization of sperm and eggs through spontaneous interaction, embryo culture for 2–5 days, and intrauterine Embryo transfer. These include not only the artificial induction of ovulation, exposure of oocytes, sperm, and embryos outside of the body environment, freezing and manipulation of oocytes and embryos, but also the risk of infertility. The transfer of multiple embryos increases the chance that at least one embryo will implant, but also results in a higher risk of multiples, which is accompanied by a higher risk of maternal and neonatal morbidity and mortality.[1]

Hayashi et al.[2] compared obstetric and perinatal outcomes between women with singleton pregnancies conceived through ART procedures and corresponding controls who conceived naturally and matched by multiple maternal characteristics, behaviors, and lifestyle factors. It is observed that the singleton pregnancies conceived through ART procedures also pose an increased risk of several adverse obstetric and perinatal outcomes.

Jackson et al.[3] estimated whether singleton pregnancies following in vitro fertilization (IVF) are at higher risk of perinatal mortality, preterm delivery, small for gestational age, and low or very low birth weight

compared with spontaneous conceptions that adjusted for age and parity. The meta-analysis showed that early preterm delivery, spontaneous preterm delivery, placenta previa, gestational diabetes, preeclampsia, and neonatal intensive care admission were also significantly more prevalent in the IVF group.

The comparison of pregnancy-related complications and adverse pregnancy outcomes of multiple pregnancies generated with assisted reproductive technology (ART) vs. spontaneous conception is provided. This study indicated that multiple pregnancies generated with ART carry an increased risk of premature rupture of membranes, pregnancy induced hypertension, gestational diabetes mellitus, pre term birth and low birth weight, compared with those conceived naturally.[4]

The studies on singleton pregnancies with ART reported a significantly increased risk of pregnancy-induced hypertension of 30%, 31% for gestational diabetes mellitus, 271% for placenta previa, 83% for placental abruption, 111% for antepartum hemorrhage, 29% for postpartum hemorrhage, 74% for polyhydramnios, 114% for oligohydramnios, 58% for cesarean sections, 64% for perinatal mortality compared with those created naturally. The study indicated that ART singleton pregnancies are associated with higher risks of pregnancy-related complications and adverse pregnancy outcomes when compared with those conceived naturally.[5]

Several studies have reported that pregnancies after ART demonstrated increased rate of GDM.[6-7] It is suggested that insulin resistance and hyperinsulinemia might partly explain the etiology of GDM.[8] GDM could be related to the relatively high prevalence of polycystic ovary syndrome (PCOS) among patients undergoing ART.[9]

Shevell et al.[10] observed an increased incidence of abnormal placentation in IVF pregnancies, and supposed that initiating of pregnancy and chorion formation in vitro might be the reasons for these complications during gestation. This study shows that the use of IVF is associated with increased maternal adverse effects, such as

preeclampsia, gestational hypertension, placental abruption, placenta previa, and the risk of cesarean delivery.

Verlaenen et al.[11] analyzed one hundred forty singleton pregnancies conceived by IVF and 140 matched control pregnancies conceived naturally with respect to the incidence of antepartum complications and perinatal outcome. It is observed that a 4-fold higher incidence of placenta previa in IVF pregnancies in 140 women compared with matched controls. Also, labor was more often induced in IVF pregnancies than in control pregnancies.

The meta-analysis done by Jackson et al.[12] reported that the IVF group had significantly higher ORs for stillbirth, early preterm delivery, spontaneous preterm birth, gestational diabetes, preeclampsia, placenta previa, vaginal bleeding, labor induction, elective and emergent cesarean, neonatal death, and neonatal intensive care unit admissions.

Schieve et al.[13] also suggested an increased risk of pregnancy-induced hypertension, preeclampsia, and abruption in ART conceptions. This study shows that women who conceive with ART are more likely than women who do not enter pregnancy with a maternal chronic condition and are at increased risk for complications during pregnancy and labor and delivery, even with singleton pregnancies and births. Also, singleton infants born after ART are at increased risk for adverse health outcomes.

Khudari et al.[14] compared obstetrical outcomes in assisted reproduction techniques (ART) with naturally conceived pregnancies and among each other in multiple reports. This study shows a significant difference in favor of naturally conceived pregnancies over ART in term of gestational age. In fact, the gestational age of babies in the spontaneously conceived group was statistically higher compared to ART group.

Pandey et al.[15] reported that IVF singleton pregnancies were associated with a higher risk of ante-partum hemorrhage, congenital anomalies, hypertensive disorders of pregnancy, preterm rupture of

membranes, low birthweight, perinatal mortality, preterm delivery, gestational diabetes, induction of labour and small for gestational age. Singletons pregnancies after IVF are associated with higher risks of obstetric and perinatal complications when compared with spontaneous conception. The study shows the rates of caesarean sections (CS) in IVF gestations are significantly higher than in spontaneously conceived ones. The relative risk of having PPROM was 1.16 in IVF conceptions, when compared with spontaneous conception.

The study explores associations between assisted reproductive technology (ART) and maternal and neonatal outcomes compared with similar outcomes following spontaneously conceived births. Singleton pregnancies or nulliparous pregnancies following ART exhibited increased maternal and neonatal complications. Therefore, it is concluded that pregnancies conceived following ART are at increased risks of antenatal complications, perinatal complications and poor neonatal outcomes, which may result from not only a higher incidence of multiple pregnancy, but also the manipulation involved in ART processes.[16]

Adverse obstetric and other long-term outcomes in pregnancies achieved through ART could be either due to the technology or to the underlying parental factors or to both. A “good perinatal outcome” among live births after ART is defined as the live birth of a singleton infant born at term (≥37 completed weeks of gestation) and at a normal birth weight (≥2,500 g) However, concern is mounting over the safety of ART and its effect on fetal well-being and perinatal outcomes.

Assisted reproductive technologies (ARTs) have been shown to be associated with general vascular dysfunction in late childhood. Children conceived by ART manifest cardiac and vascular remodeling that is present in fetal life and persists in postnatal life, suggesting opportunities for early detection and potential intervention.[17]

Pontesilli et al.[18] investigated the effects of artificial reproductive techniques and subfertility on cardiovascular and metabolic profiles of children aged 5–6 years. A higher glucose levels were found among

children conceived through ovulation induction and IVF compared with children of fertile couples. It is also found that higher blood pressure among children of subfertile couples, suggesting parental subfertility is associated with poorer cardiovascular risk profile in the offspring.

Dhont et al.[19] analyzed 3057 IVF singleton pregnancies and proved that the rate of preterm deliveries, LBW and very low birth weight (VLBW) was significantly higher. It is observed that the perinatal outcome of singleton pregnancies obtained with in vitro fertilization is significantly worse than that of spontaneously conceived pregnancies, mainly because of the increased rate of preterm birth. The outcome of twin pregnancies obtained with in vitro fertilization is comparable with that of normally conceived twins. For both singleton and twin pregnancies obtained with in vitro fertilization, the incidence of cesarean delivery is increased.

Qin et al.[20] analyzed fifty-two cohort studies on IVF singleton births and spontaneously conceived singleton births regarding adverse perinatal outcome. They again showed the higher prevalence of PTB/VPTB (very preterm birth) and LBW among IVF singletons. The IVF singleton pregnancies are at a higher prevalence of adverse perinatal outcomes compared with those conceived naturally.

The goal of any ART treatment must be to secure the health of the patients and the children. This can only be fulfilled by continuous follow-up and by documentation and traceability of all methods performed and all materials used. Several studies have suggested that the composition of the media that embryos are cultured in may have an impact on the quality of embryos generated in IVF cycles thereby influencing implantation and pregnancy rates.[21-22]

We plan to comprehensively study the effects of high technology infertility treatments on maternal and perinatal outcomes. In this study we will analyse the age and parity matched maternal and perinatal outcomes in IVF and spontaneously conceived pregnancy.

6.3 AIMS AND OBJECTIVES OF THE STUDY

Primary objective

To study the maternal outcomes in mothers who opted for IVF.

Secondary objective

To study the perinatal outcome in children who were conceived using IVF.

7. MATERIALS AND METHODS

The study would consist of selected women who deliver at DMCH between September 2022- September 2023. Study group would consist of 50 patients who conceived by means of IVF. Control group would consist of 50 women who conceived spontaneously and delivered within the same time period matched by age (±2 years) and parity.

7.1 SOURCE OF DATA

The data would be collected from IVF and spontaneously conceived women who deliver at Dayanand Medical College and Hospital Ludhiana, a tertiary care hospital from 15 September 2022 to 14 September 2023. IVF and spontaneously conceived women would be enrolled at 20 weeks of pregnancy and will be followed.

7.2 METHOD OF COLLECTION OF DATA

Inclusion Criterion

1. 20-45 years old pregnant consented females who deliver at DMCH between Sept 2022 to Sept 2023.
2. Gestational age at time of delivery of 20 weeks and above.

Duration of Study/ Number of cases

1. September 2022- September 2023
2. Number of cases is 50
3. Number of controls is 50

Outcome

All patients fulfilling inclusion criteria will be recruited for study. Written and informed consent will be taken from all patients participating in study. A structured predesigned proforma will be used for the study. A detailed history, physical examination and clinical assessment and relevant investigations will be done.

The primary objective is to study the age and parity matched maternal outcomes in IVF pregnancies compared with the spontaneously conceived pregnancies.

1. Gestational age at delivery
2. Mode of delivery
3. Maternal complications like hypertension, diabetes mellitus, premature rupture of membranes

The secondary objective is to study the perinatal outcomes in IVF pregnancies compared with the spontaneously conceived pregnancies.

1. Birth weight
2. Sex ratio
3. NICU admission
4. Perinatal Mortality and Morbidity

<u>Statistical Analysis</u>

Comparison of maternal and perinatal outcomes in IVF pregnancies to spontaneously conceived pregnancy will be analyzed using appropriate statistical methods. Data will be described in terms of range; mean ±standard deviation (± SD), frequencies (number of cases) and relative frequencies (percentages) as appropriate. Comparison of quantitative variables between the study groups will be done using Student t-test and Mann Whitney U test for independent samples for parametric and non-parametric data respectively. For comparing categorical data, Chi square ($\chi 2$) test will be performed and exact test was used when the expected frequency is less than 5. A probability value (p value) less than 0.05 will be considered statistically significant. All statistical calculations will be done using (Statistical Package for the Social Science) SPSS 21version (SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows.

7.3 DOES THE STUDY REQUIRE ANY INVESTIGATIONS OR INTERVENTIONS TO BE CONDUCTED ON PATIENTS OR OTHER HUMANS OR ANIMALS? IF SO, PLEASE DESCRIBE BRIEFLY.

All the above-mentioned investigations are routinely performed as per the hospital guidelines. Hence will not pose any financial burden on the patient.

7.4 HAS ETHICAL CLEARENCE BEEN OBTAINED FROM YOUR INSTITUTION IN CASE OF 7.3?

Attached herewith.

8. LIST OF REFERENCES

1. Yang X, Li Y, Li C, Zhang W. Current overview of pregnancy complications and live-birth outcome of assisted reproductive technology in mainland China. Fertil Steril. 2014;101: 385-91.
2. Hayashi M, Nakai A, Satoh S, Matsuda Y. Adverse obstetric and perinatal outcomes of singleton pregnancies may be related to maternal factors associated with infertility rather than the type of assisted reproductive technology procedure used, Fertil Steril. 2012; 98: 922–8.
3. Jackson RA, Gibson KA, Wu YW, Croughan MS. Perinatal outcomes in singletons following in vitro fertilization: a meta-analysis. Obstet Gynecol. 2004;103:551–63.
4. Qin J, Wang H, Sheng X, Liang D, Tan H, Xia J. Pregnancy-related complications and adverse pregnancy outcomes in multiple pregnancies resulting from assisted reproductive technology: a meta-analysis of cohort studies. Fertil Steril. 2015; 103:1492-508.
5. Qin J, Liu X, Sheng X, Wang H, Gao S. Assisted reproductive technology and the risk of pregnancy-related complications and adverse pregnancy outcomes in singleton pregnancies: a meta-analysis of cohort studies. Fertil Steril. 2016;105: 73-85.
6. Reddy UM, Wapner RJ, Rebar RW, Tasca RJ. Infertility, assisted reproductive technology, and adverse pregnancy outcomes: executive summary of a National Institute of Child Health and Human Development workshop. Obstet Gynecol. 2007;109;967-77.
7. Allen VM, Wilson RD, Cheung A. Pregnancy outcomes after assisted reproductive technology. J Obstet Gynaecol Can. 2006;28:220-33.
8. Kopp W. Role of high-insulinogenic nutrition in the etiology of gestational diabetes mellitus. Med Hypotheses. 2005;64:101-103.

9. Maman E, Lunenfeld E, Levy A, Vardi H, Potashnik G. Obstetric outcome of singleton pregnancies conceived by in vitro fertilization and ovulation induction compared with those conceived spontaneously. Fertil Steril. 1998;70:240-5.
10. Shevell T, Malone FD, Vidaver J, Porter TF, Luthy DA, Comstock Ch, et al. Assisted reproductive technology and pregnancy outcome. Obstetrics & Gynecology. 2005;106:1039-45.
11. Verlaenen H, Cammu H, Derde MP, Amy JJ. Singleton pregnancy after in vitro fertilization: expectations and outcome. Obstet Gynecol. 1995;86:906-10.
12. Jackson RA, Gibson KA, Wu YW, Croughan MS. Perinatal outcomes in singletons following in vitro fertilization: a meta-analysis. Obstet Gynecol. 2004;103:551-63.
13. Schieve LA, Cohen B, Nannini A, Ferre C, Reynolds MA, Zhang Z et al. Massachusetts Consortium for Assisted Reproductive Technology Epidemiologic Research (MCARTER). A population-based study of maternal and perinatal outcomes associated with assisted reproductive technology in Massachusetts. Matern Child Health J. 2007;11:517-25.
14. Khudhari A, Mourad A, Phillips S, Alam MZ, Hemmings R, Jamal W. Perinatal outcomes of human singletons conceived naturally versus assisted reproductive technologies: analysis of the effect of stimulated IVF, modified natural IVF, and frozen embryo transfer. Middle East Fertility Society Journal. 2021;26:1-8.
15. Pandey S, Shetty A, Hamilton M, Bhattacharya S, Maheshwari A. Obstetric and perinatal outcomes in singleton pregnancies resulting from IVF/ICSI: a systematic review and meta-analysis. Hum Reprod Update. 2012;18;485-503.
16. Zhu L, Zhang Y, Liu Y, Zhang R, Wu Y, Huang Y et al. Maternal and Live-birth Outcomes of Pregnancies following Assisted Reproductive Technology: A Retrospective Cohort Study. Sci Rep. 2016;6:35141.

17. Valenzuela-Alcaraz B, Crispi F, Bijnens B, Cruz-Lemini M, Creus M, Sitges M et al. Assisted reproductive technologies are associated with cardiovascular remodeling in utero that persists postnatally. Circulation. 2013;128:1442-50.
18. Pontesilli M, Painter RC, Grooten IJ, van der Post JA, Mol BW, Vrijkotte TG et al. Subfertility and assisted reproduction techniques are associated with poorer cardiometabolic profiles in childhood. Reprod Biomed Online. 2015; 30:258-67.
19. Dhont M, De Sutter P, Ruyssinck G, Martens G, Bekaert A. Perinatal outcome of pregnancies after assisted reproduction: a case-control study. Am J Obstet Gynecol. 1999;181: 688-95.
20. Qin JB, Sheng XQ, Wu D, Gao SY, You YP, Yang TB et al. Worldwide prevalence of adverse pregnancy outcomes among singleton pregnancies after in vitro fertilization/intracytoplasmic sperm injection: a systematic review and meta-analysis. Arch Gynecol Obstet. 2017;295:285-301.
21. Sunde A, Brison D, Dumoulin J, Harper J, Lundin K, Magli MC, et al. Time to take human embryo culture seriously. Hum Reprod. 2016;31:2174-82.
22. Mantikou E, Youssef M, van Wely M, Van der Veen F, Al-inany H, at al. Embryo culture media and IVF/ICSI success rates: a systematic review. Hum Reprod Update 2013;19:210–20.

PROFORMA

Sr. No.

Name:

Age:

Date of admission:

Admission number:

MRD number:

Phone number

Residential address: rural/ urban

Education: undergraduate/ graduate/ postgraduate

Occupation: housewife/ employed

Socio-economic status:

Married since:

Booked/ Unbooked:

Menstrual history:

LMP:

• Obstetric history:

Parity

Mode of conception

Spontaneous or IVF

Indication for IVF

Male factor

Female factor

Egg self/donor

Semen self/donor

Embryo transfer

No. of embryos transferred

• Past Medical history

Past Surgical history

• Substance abuse alcohol/ cigarette

• General physical examination:

Signature of Candidate **Signature of Supervisor**

Weight:
Height:
BMI:
P/A:
L/E:

• INVESTIGATIONS:
ABORH
CBC
PTI/INR
PTTK RATIO
URINE R/E
RFT
LFT
RBS
TSH
Viral markers
VDRL
HPLC
NB NT SCAN
DUAL marker
Level 2 scan
Quad
USG Fetal Well Being and doppler

MATERNAL OUTCOME:
• Plurality- singleton/ multiple
• Antenatal complications
  o Hypertension
  o Diabetes
  o Pprom
  o Preterm labour
• Period of gestation at time of delivery
• DATE OF DELIVERY
• Mode of delivery:
  Vaginal (spontaneous or induced) (with forceps/ without forceps)
  Caesarean section
  Elective or Emergency
  Indication of cesarean section
• Intrapartum complications
• Post partum complications
• Date of discharge

Signature of Candidate **Signature of Supervisor**

NEONATAL OUTCOMES:

Birth weight
Sex
Date and Time of birth
Apgar
NICU stay
Neonatal complications
Congenital malformations
Date of discharge

Signature of Candidate **Signature of Supervisor**

INFORMED PATIENT CONSENT

Date: _____

I…….D/o, W/o, S/o……..…… am willing to participate in the study **"MATERNAL AND PERINATAL OUTCOMES IN IVF PREGNANCIES COMPARED TO SPONTANEOUSLY CONCEIVED PREGNANCIES"** The procedure with its complications has been explained to me in local vernacular language. I have fully understood that no special tests and extra expenditure in any form, merely for the purpose of thesis is being carried out. I am free to opt out the study any time without assigning any reason.

…… ……

Signature of the Witness Signature of the patient

Name:

Signature of Candidate **Signature of Supervisor**

मरीज अनुमति फार्म

तिथि _____

मैं _____ पत्नी/पुत्र/पुत्री _____

निवासी _____

इस शोधकार्य "**MATERNAL AND PERINATAL OUTCOMES IN IVF PREGNANCIES COMPARED TO SPONTANEOUSLY CONCEIVED PREGNANCIES**" में भाग लेने के लिए सहमत हूँ। मैं इस शोधकार्य में भाग लेने के लिए अपनी स्वेच्छा से तैयार हूँ। मैं पुष्टि करता/करती हूँ की यह स्वीकृति देने के लिए मुझे कोई आर्थिक प्रलोभन नहीं दिया गया और न ही दबाव डाला गया है। मुझे इस शोधकार्य का उद्देश्य स्पष्ट कर दिया गया है और मुझे यह विश्वास है की यह विज्ञान और मानवता के लाभ के लिए है। मुझे इस शोधकार्य में होने वाले जोखिम के बारे में समझा दिया गया है और मेरी समझ में यह जोखिम बहुत मामुली है।

मैं इस शोधकार्य में भाग लेने के सम्बन्ध में किसी भी समय अपनी अस्वीकृति व्यक्त कर सकता/सकती हूँ और मेरे अस्वीकृति व्यक्त करने का मेरे इलाज पर कोई प्रभाव नहीं पड़ेगा।

_____	_____
गवाह के हस्ताक्षर	रोगी के हस्ताक्षर/अंगूठे का निशान
नाम:	नाम:

_____

अन्वेषक के हस्ताक्षर

_____

विद्यार्थी के हस्ताक्षर

ਮਰੀਜ਼ ਰਜ਼ਾਮੰਦੀ ਫਾਰਮ

ਮਿਤੀ_____

ਮੈ_____ਪਤਨੀ/ਪੁੱਤਰ/ਪੁੱਤਰੀ_____

ਵਾਸੀ _____

“MATERNAL AND PERINATAL OUTCOMES IN IVF PREGNANCIES COMPARED TO SPONTANEOUSLY CONCEIVED PREGNANCIES” ਤੇ ਚਲ ਰਹੀ ਖੋਜ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਰਜ਼ਾਮੰਦ ਹਾਂ। ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਮੈ ਆਪਣੀ ਮਰਜ਼ੀ ਨਾਲ ਤਿਆਰ ਹਾਂ। ਮੈ ਇਹ ਦਸਣਾ ਚਾਹੁੰਦਾ ਹਾਂ/ ਚਾਹੁੰਦੀ ਹਾਂ ਕੇ ਇਹ ਰਜ਼ਾਮੰਦੀ ਦੇਣ ਵਾਸਤੇ ਮੈਨੂ ਕਿਸੇ ਵੀ ਤਰਾਂ ਦਾ ਲੋਭ-ਲਾਲਚ ਨਹੀ ਦਿੱਤਾ ਗਿਆ ਅਤੇ ਨਾ ਹੀ ਕੋਈ ਦਬਾ ਪਾਇਆ ਗਿਆ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਦਾ ਮਨੋਰਥ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਭਰੋਸਾ ਦਵਾਇਆ ਗਿਆ ਹੈ ਕੇ ਇਹ ਖੋਜ ਵਿਗਿਆਨ ਅਤੇ ਮਾਨਵਤਾ ਦੀ ਭਲਾਈ ਲਈ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਵਿਚ ਹੋਣ ਵਾਲੇ ਖਤਰੇ ਬਾਰੇ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਯਕੀਨ ਹੈ ਕੇ ਇਹ ਖਤਰਾ ਬਹੁਤ ਮਾਮੂਲੀ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਦਾ ਢੰਗ – ਤਰੀਕਾ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ।

ਮੈ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਬਾਰੇ ਆਪਣੀ ਰਜ਼ਾਮੰਦੀ ਕਿਸੇ ਵੀ ਸਮੇ ਵਾਪਸ ਲੈ ਸਕਦਾ ਹਾਂ/ ਸਕਦੀ ਹਾਂ ਅਤੇ ਮੇਰੀ ਰਜ਼ਾਮੰਦੀ ਵਾਪਸ ਲੈਣ ਦਾ ਮੇਰੇ ਇਲਾਜ ਤੇ ਕੋਈ ਅਸਰ ਨਹੀ ਹੋਵੇਗਾ।

_____ _____

ਗਵਾਹ ਦੇ ਹਸਤਾਖਰ ਮਰੀਜ਼ ਦੇ ਹਸਤਾਖਰ

ਮਿਤੀ_____ ਮਿਤੀ_____

ਪਤਾ _____ ਪਤਾ _____

_____

ਨਿਰੀਖਕ ਦੇ ਹਸਤਾਖਰ

_____

ਸਿਖਿਆਰਥੀ ਦੇ ਹਸਤਾਖਰ